ECHNOLOGY DEPT.

GULF COAST OIL AND GAS JOURNAL

Anniversary Number

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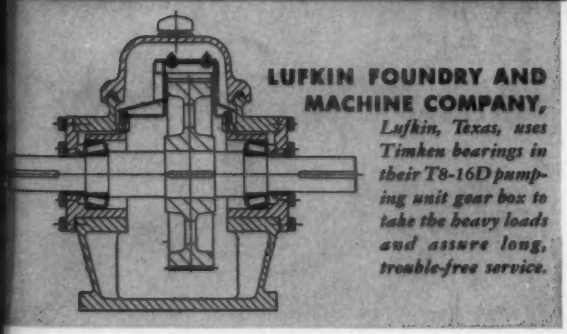
JUN 25 1950
DETROIT

How TIMKEN® bearings give a pitman arm a hand

TO take the pitman load and to help keep reduction gears in alignment, the crankshaft of this Lufkin T8-16D pumping unit is mounted on Timken® tapered roller bearings. Timken bearings at this important point assure long, trouble-free service with a minimum of maintenance.

Timken bearings carry radial and thrust loads in any combination. Line contact between rollers and races gives greater load capacity. Shafts are held in alignment, providing proper gear meshing and reducing wear on moving parts. The true rolling motion and smooth surface finish of Timken bearings virtually eliminate friction. Advanced design permits tighter closures that retain lubricants more effectively. Maintenance costs are minimized.

No other bearing gives you *all* the advantages you get with Timken bearings. Insist on them in machines you buy or build. Look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, O. Cable address: "TIMROSCO".

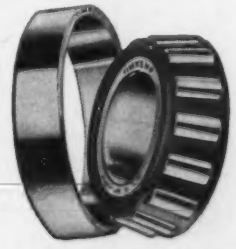


LUFKIN FOUNDRY AND MACHINE COMPANY, *Lufkin, Texas, uses Timken bearings in their T8-16D pumping unit gear box to take the heavy loads and assure long, trouble-free service.*

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ⊂⊃ THE TIMKEN TAPERED ROLLER ⊂⊃ BEARING TAKES RADIAL ◎ AND THRUST →◎← LOADS OR ANY COMBINATION

XUM

HOWCO

HYDRAULIC METHOD FOR INCREASING PRODUCTION

This proved process has provided profitable production in wells which might otherwise have been abandoned, both old and new. It has increased production in wells where every other method tried has failed.

No small part of the success of HYDRAFRAC is due to HOWCO's thorough research and scientific planning. Thickness and permeability of producing formation, bottom hole pressure, well depth, pipe size and condition, nature of the overburden are but a few of the many factors which HOWCO takes into consideration.

A telephone call to your nearest HOWCO representative could mean the difference between profit and loss on your low producing wells or better completion of new wells. He'll recommend HOWCO HYDRAFRAC only if your well analysis indicates its application.

• HYDRAFRAC IS A SERVICE MARK OF STANOLIND OIL AND GAS CO.

There is no substitute for experience in oil well cementing!

HALLIBURTON OIL WELL CEMENTING COMPANY

DUNCAN • OKLAHOMA

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A
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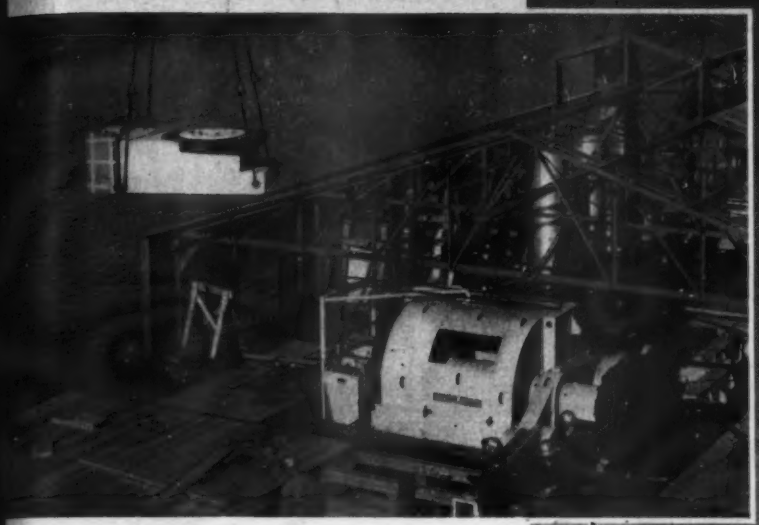

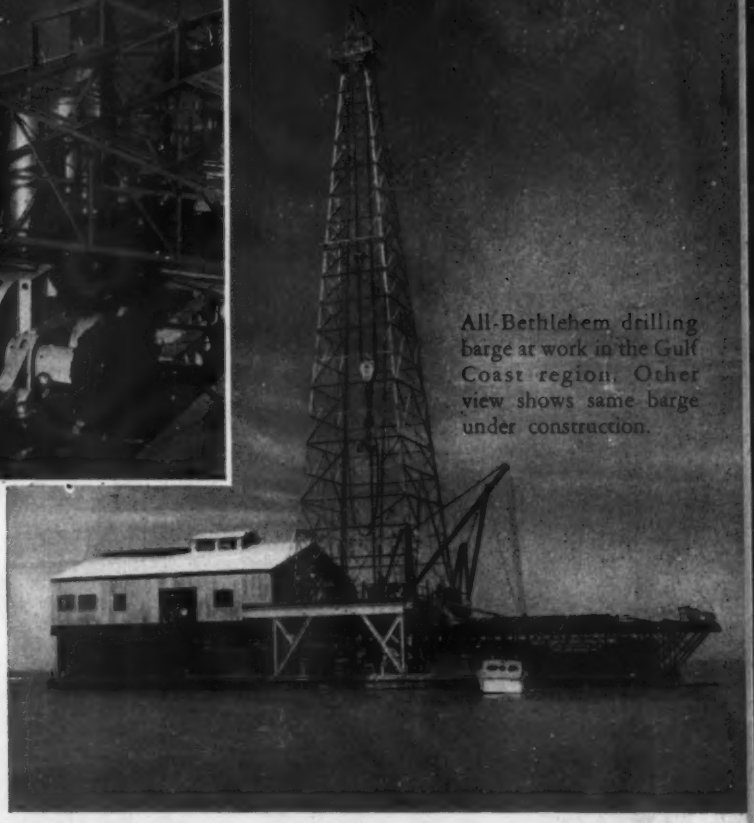

All-Bethlehem drilling barge at work in the Gulf Coast region. Other view shows same barge under construction.

Make it an ALL-BETHLEHEM DRILLING BARGE

...and watch the complications disappear

Bethlehem is the only organization with facilities for building complete submersible drilling barges and the necessary complements of drilling machinery. This unique combination offers substantial advantages that cannot be duplicated anywhere else.

It places at the customer's disposal the vast experience of Bethlehem Supply, one of the world's great builders of rotary drilling equipment. It dovetails this with the specialized knowledge of Bethlehem's Beaumont shipyard —a yard that has built more than half the country's total of drilling barges.

Bethlehem is therefore equipped to do the *whole* job—build the barge, build and install the drilling units, handle the piping, outfit everything. The customer is thus able to centralize responsibility; Bethlehem answers to him from the start. Gone are the worries, complications, mixups that so often occur when dealing with a dozen or more companies on the same job.

Every item of drilling equipment, every detail of the barge, is engineered to fit harmoniously into the general pattern. This is made possible by the close supervision of a unified technical staff, whose work is co-ordinated at all times with that of the other divisions.

An all-Bethlehem drilling barge will serve its owner well for years to come. No finer outfit can be purchased anywhere. Oil companies and contractors are invited to discuss details with representatives of Bethlehem Supply or Bethlehem's Beaumont, Texas, shipyard.

BETHLEHEM SUPPLY COMPANY

GENERAL OFFICES: 21 E. SECOND ST., TULSA, OKLA.

BETHLEHEM STEEL COMPANY

Shipbuilding Division

GULF COAST YARD: BEAUMONT, TEXAS

Subsidiaries of Bethlehem Steel Corporation

WATER TURKEY OR SNAKE BIRD

SPECIALISTS IN *Southwest* CONSTRUCTION

If your plans call for a construction project in the Southwest you'll profit from Brown & Root's "know-how" gained in more than thirty years' experience in this area.

A thorough knowledge of soil, climatic conditions and terrain unique to the Southwest has resulted in the development of specialized techniques, proved engineering and construction processes by Brown & Root. All of these facts plus a thoroughly loyal organization can add up to faster and cheaper completion of your project.

Why not let Brown & Root's experience work for your organization?

BROWN-BILT

BROWN & ROOT, Inc. *Engineers • Constructors*

P. O. BOX 3, HOUSTON 1, TEXAS

CABLE ADDRESS — BROWNBILT

Associate Companies:— BROWN ENGINEERING CORP. • BROWN & ROOT MARINE OPERATORS INC.

Air Casualties

It's bad air that does it. But you can step up production by putting a Coppus Blower on the job to keep the air moving — and keep the men cool.

The kind of air a man works in has a lot to do with how much work he can turn out.

In confined places like shipholds or tanks or drums or boilers . . . or wherever the air is stagnant or hot or full of fumes . . . a Coppus Blower is a *must* for getting first-class work out of the men, all the time.

A Coppus Blower or Exhauster helps avoid sickness and lassitude due to bad air . . . and improves morale, too.

Portable and adaptable for special purposes, Coppus Blowers and Exhausters will have dozens of uses around your plant. The "Blue Ribbon" (a blue painted band) is your assurance of quality performance at lowest cost.

COPPUS

BLUE RIBBON BLOWERS

CABLE MANHOLE AND TANK VENTILATORS — BOILER MANHOLE BLOWERS AND EXHAUSTERS — HEAT KILLERS — SHIPHOLD VENTILATORS . . . DESIGNED FOR YOUR INDUSTRY — ENGINEERED FOR YOU

MAIL THIS COUPON To Coppus Engineering Corp., 267 Park Avenue, Worcester 2, Mass. Sales offices in THOMAS' REGISTER. Other "Blue Ribbon" Products in BEST'S SAFETY DIRECTORY.

PLEASE SEND ME INFORMATION ON SUPPLYING FRESH AIR TO MEN WORKING:

- ☐ in tanks, tank cars, drums, etc.
- ☐ in underground cable manholes.
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- ☐ on coke ovens.
- ☐ on steam-heated rubber processes.
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COOLING:

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- ☐ wires and sheets.
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- ☐ exhausting welding fumes.
- ☐ stirring up stagnant air wherever men are working or material is drying.
- ☐ drying of walls, sheets, etc., after treated with coating material.

NAME .....

COMPANY .....

ADDRESS .....

CITY .....

(Write here any special ventilating problem you may have.)

Spicer Universal Joints—

BUILT LIKE AN OX

Not an ounce of excess weight

Built for work . . . steady, safe, dependable. Big and broad in the shoulders, fortified by sinews of steel that handle heavy loads with ease and efficiency. Rigidity —*the essence of accuracy*— is assured by Spicer one-piece solid yoke construction. Spicer "built-like-an-ox" construction has patented features that will serve your equipment better . . . on the boulevard or in the backwoods. Spicer Universal Joints are built with a reputation to maintain . . . a 46-year service record unequalled in the industry. With this prestige we have an obligation to fulfill . . . in engineering, manufacturing and service of the highest order.

SPICER MANUFACTURING • *Division of Dana Corporation*

TRANSMISSIONS • PASSENGER CAR AXLES • PROPELLER SHAFTS
UNIVERSAL JOINTS • FORGINGS • TORQUE CONVERTERS
RAILWAY GENERATOR DRIVES • SPICER "BROWN-LIPE" GEAR BOXES

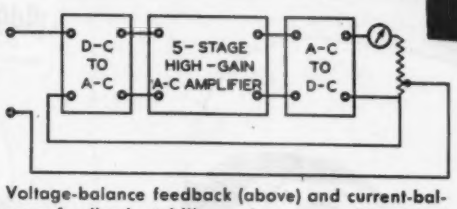
46 YEARS OF Spicer SERVICE

TOLEDO 1, OHIO

PARISH FRAMES
STAMPINGS
CLUTCHES

For low-level d-c measurements Use these new, triple-purpose D-C INDICATING AMPLIFIERS

stabilized for zero and gain



Voltage-balance feedback (above) and current-balance feedback stabilize gain . . . provide virtual null balance.

SPECIFICATIONS

MICROVOLT UNIT	MICRO-MICRO-AMPERE UNIT
Catalog No. 9835	Catalog No. 9836
FULL SCALE RANGES WITH BUILT-IN 4" METERS	
0 to 50 or —25 to +25 Microvolts; scale multipliers: 1,2,4,10, 20,40	0 to 1000 or —500 to +500 Micro-Micro-amps; scale multipliers: 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000
ACCURACY	
Of amplifier: ±0.4% of reading ±0.5 Microvolt; Of meter: ±1%	Of amplifier: ±0.5 to 0.8%* of reading ±20 Micro-Micro-amps; Of meter; ±1%
STABILITY	
Zero and Gain stabilized automatically. No trimmer controls required.	
***SOURCE RESISTANCE**	
Up to 10,000 ohms.	0.1 megohm or more.
RESPONSE TIME	
2 to 3* sec.	2 to 3* sec.
OUTPUT	
For full scale input on any range: 10 millivolts at output impedance of 500 ohms for null recorder; 1 volt for 20,000-ohm external meter.	

Front panel fits standard 19" relay rack.

*Accuracy and Response Time depend on Source Resistance.

USE AS

- **DIRECT-READING MICROVOLTMETER OR MICRO-MICROAMMETER**
- **RECORDER PREAMPLIFIER**
- **NULL DETECTOR**

These new instruments are not only D-C Indicating Amplifiers but are stable, accurate measuring instruments as well. You can use them in measurements with thermocouples, strain gages, bolometers . . . bridge and potentiometer circuits . . . ionization, leakage, and phototube currents . . . almost any measurement of extremely small direct current or voltage.

Through a combination of a-c amplification and unique balanced feedback network, zero and gain stability are designed right into the instrument. Trimmer controls are designed out—eliminated.

Actually *three* instruments in one, these amplifiers can be used as—

Direct-reading instruments . . . At the turn of a scale-multiplier knob, you simply select the range in which you want to work.

Recorder preamplifiers . . . with broad flexibility. For instance, one or two degrees of temperature difference can be spread across an entire Speedomax recorder scale.

Null detectors . . . more sensitive than most reflecting galvanometers, yet with full scale response time of only 2 to 3 seconds. Leveling is unnecessary. There's no worry about shock or vibration. At the turn of a range knob, you have available a wide choice of sensitivities. External shunts are not required. And when using non-linear response, not only does the instrument stay on scale at extreme unbalance; sensitivity increases automatically as the null point is approached. For details, write to Leeds & Northrup Co., 4959 Stenton Ave., Phila. 44, Pa.

MEASURING INSTRUMENTS TELEMETERS AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

LEEDS & NORTHRUP CO.

Jrl. Ad EM9-51(1)

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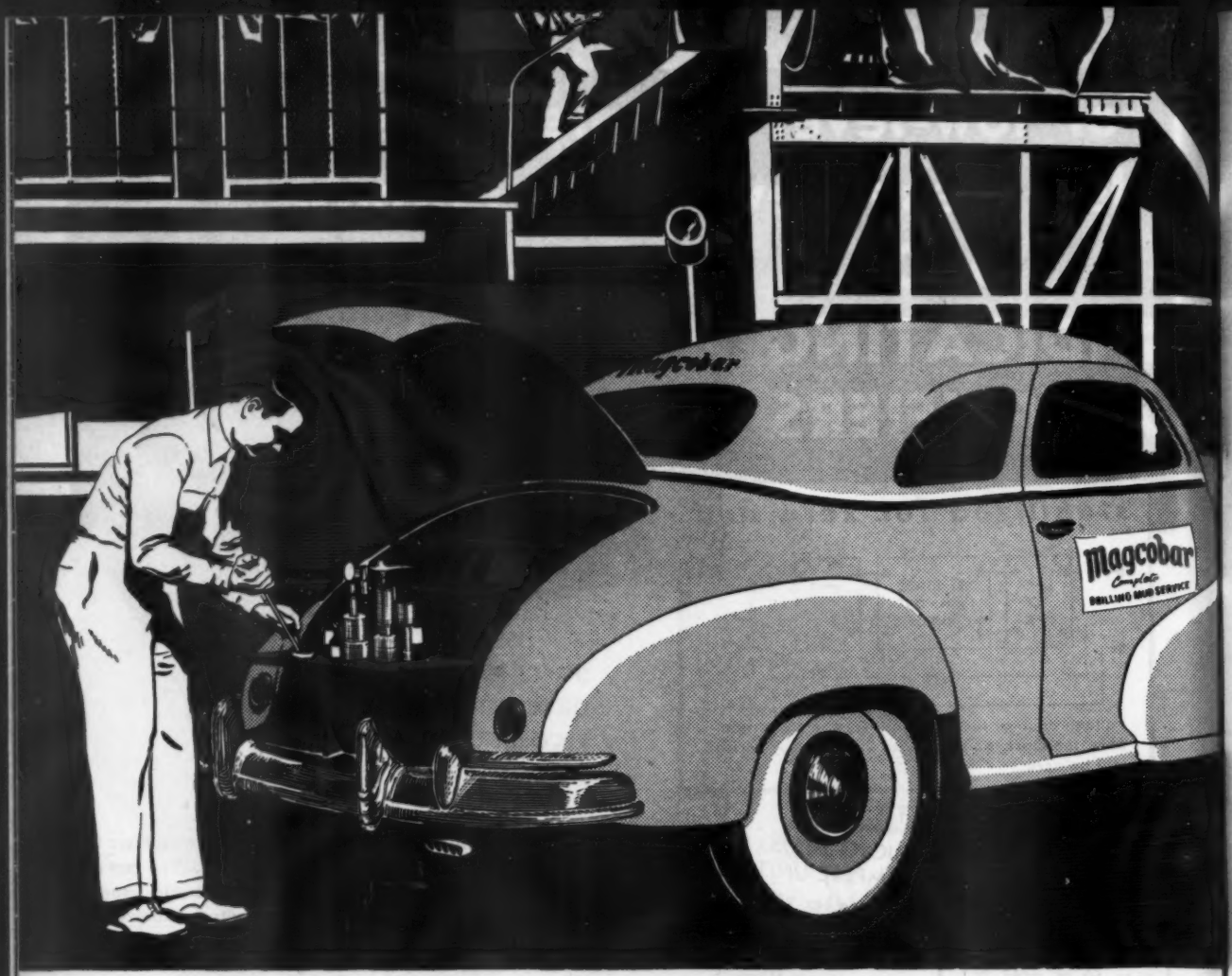


MUD DOCTOR

YOUR MAGCOBAR ENGINEER IS READY DAY OR NIGHT TO HELP YOU MEET ANY MUD EMERGENCY

Sometimes the solution to a mud problem hinges on prompt, accurate laboratory analysis . . . and immediate availability of the right mud weighting material or chemical. Magcobar has met this challenge with a staff of capable and experienced field engineers working in close cooperation with an aggressive dealer organization.

With their laboratory-equipped field cars . . . complete with radio telephones for immediate contact . . . Magcobar engineers are available night and day to assist operators with their mud problems right at the rig. To meet the demands of the Magcobar engineer's laboratory diagnosis, there are more than 250 stockpiles of Magcobar mud weighting materials and chemicals strategically located at dealers' stores throughout the oil fields.

The next time you need mud, look for the dealer who stocks Magcobar. He is ready, with your Magcobar field engineer, to give you night and day service.

MAGNET COVE BARIUM CORPORATION

MALVERN, ARKANSAS HOUSTON, TEXAS

Export: Daniels, Beckley and Associates
30 Rockefeller Plaza New York, N. Y.

LOOK FOR THIS SIGN WHEN YOU NEED MUD

MAGCOBAR ● MAGCOGEL ● HIGH YIELD DRILLING MUD ● XACT CLAY ● FIBER-SEAL ● MAGCO-MICA ● TANNATHIN ● JEL-OIL MUD ● JEL-OIL "E" ● SALT GEL ● NOHEEV ● SEAL FLAKES ● MY-LO-JEL ● CHEMICALS

Magcobar
Complete
DRILLING MUD SERVICE
DEALER

For a bigger choice of better piping Choose from the broad CRANE line

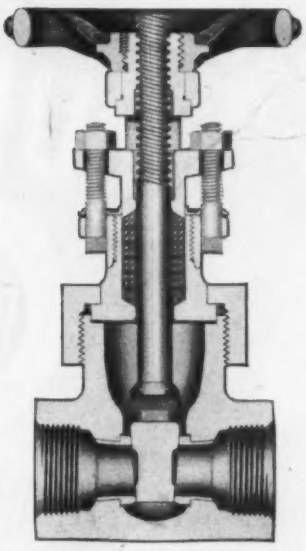
LOW IN PRICE . . . HIGH IN PERFORMANCE

Need small steel valves you can count on for quality performance . . . yet are low in initial and maintenance costs? Then specify these Crane 600-Pound Union Bonnet Small Steel Gates.

They're strong—body, bonnet, and yoke are high quality Crane carbon steel. And they're easy to operate. Wedge disc, closely guided throughout travel, does not get out of line or jam in body. Non-rigid disc-stem connection prevents stem distortion and binding of parts.

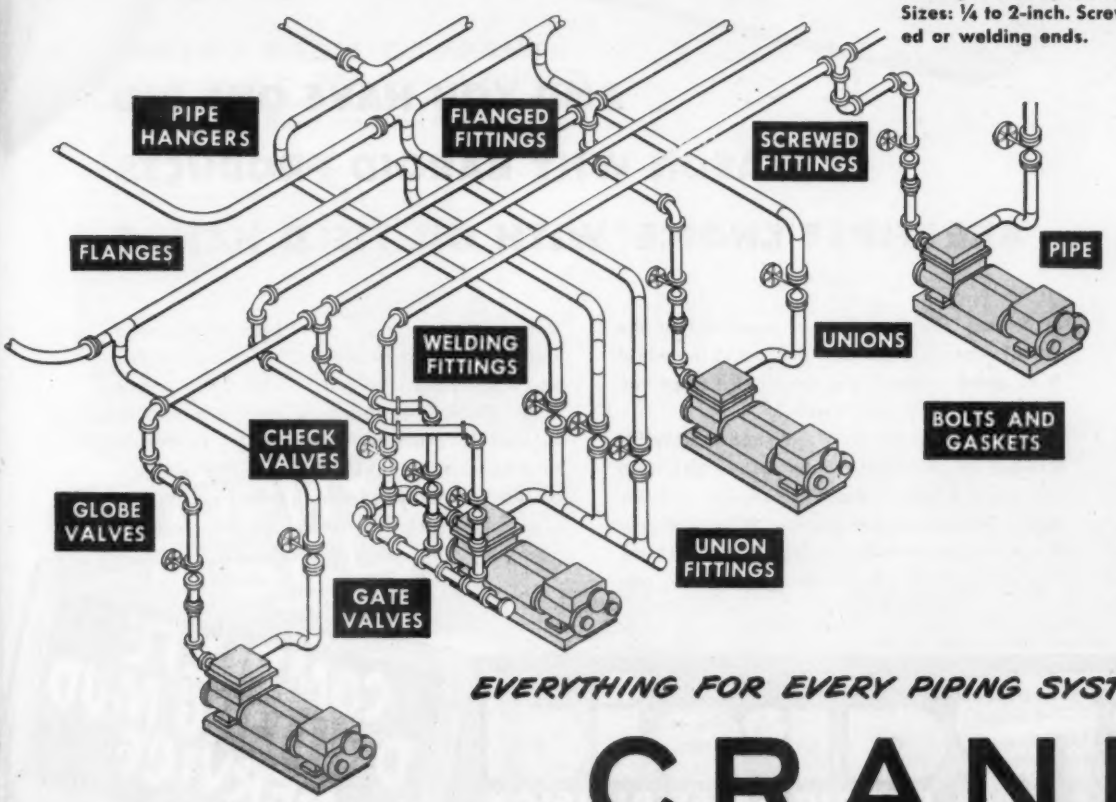
Want maximum protection against leakage? Then note these features: Stuffing box—deep and filled with high-quality packing. Bonnet joint—male and female design, fitted with soft iron gasket. Body seat rings—securely rolled-in to prevent loosening in service. See your No. 49 Crane Catalog, or send for Circular AD-1741.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas



No. 3602X, 600-Pound Small Steel Gate for oil or oil vapor up to 1000° F. Exelloy to Exelloy seating. Sizes: ¼ to 2-inch. Screwed or welding ends.

DISTILLATION PUMP ROOM PIPING, FOR EXAMPLE, CAN BE COMPLETELY EQUIPPED ON ONE ORDER TO CRANE



EVERYTHING FOR EVERY PIPING SYSTEM

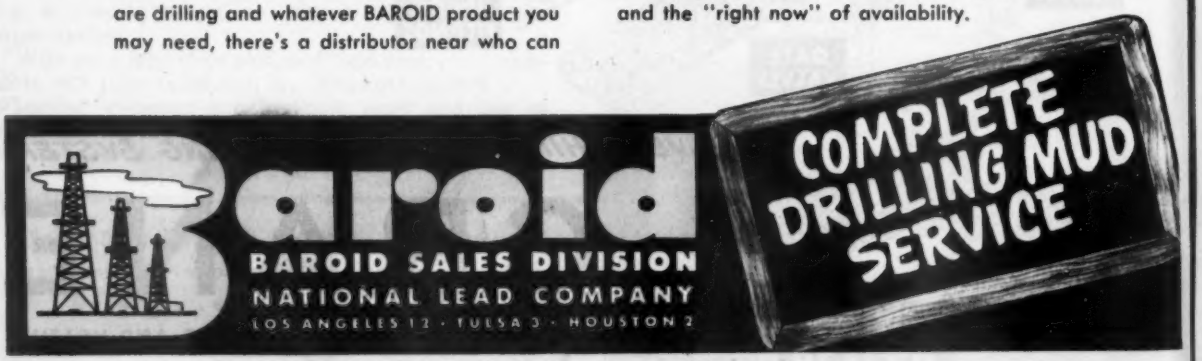
CRANE

VALVES • FITTINGS • PIPE • PLUMBING AND HEATING

AND YOU HAVE ONE BIG REASON WHY BAROID PRODUCTS ARE "FIRST CHOICE" WITH OIL FIELD HANDS

In drilling, the WHEN is as important as the WHAT—because the best product in the world is no good to you if you can't get it when you need it. Oil wells won't wait.

Baroid makes certain of that important WHEN through its 500 dealers and distributors, who provide practically immediate service to every active oil field in the country. Wherever you are drilling and whatever BAROID product you may need, there's a distributor near who can deliver it to you, *right now!* Even if your need demands more than any dealer has on his floor, you'll still have it in a matter of a few hours, since BAROID distributors are strategically located to provide "overlapping" service in emergencies. BAROID is first choice with experienced operators for both WHAT and WHEN —the high quality of all the Baroid products, and the "right now" of availability.



There's no substitute for making hole...

thats why

Joe Wyant selects MURPHY DIESEL POWER for his own rigs

AS drilling superintendent for other drillers, Joe Wyant of Guyman, Oaklahoma, had a chance to learn first hand how Murphy Diesels perform on drilling rigs. So it was natural for him to select a Murphy Diesel powered rig when he recently began contracting with his own equipment. A second rig added later was also Murphy powered.

If you want real performance on your rig, find out more about Murphy Diesel Power . . ask Murphy owners for their opinions and write for a copy of the booklet *"10 Questions to Ask a Diesel Engine Salesman."*

MURPHY DIESEL COMPANY
5305 W. Burnham St., Milwaukee 14, Wisconsin
OIL INDUSTRY FACTORY BRANCH—Sales, Parts and Service:
113-117 South Elwood Street, Tulsa, Oklahoma

MURPHY DIESEL

Heavy duty power
for the oilfields

Murphy Diesel Engines and Power Units for drilling and pipe line pumping, 90 to 220 H.P. Generator Sets 60 to 133 K.W.

See Your Murphy Diesel Dealer

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Engine Sales & Service

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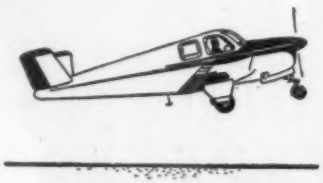
Pershing Equipment Co.

HOUSTON, TEXAS
Houston Engine & Pump Co., Inc.

KILGORE, TEXAS
B & G Engine Service

ODESSA, TEXAS
Electric Service & Supply Co.

This greater-than-ever Beechcraft is a better-than-ever value!

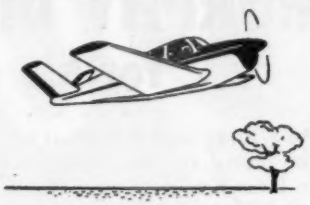


Increased Horsepower Rating at Take-off

Take-off horsepower rating is now 196 hp at 2450 rpm, providing improved take-off performance without sacrifice of long engine life, low operating and maintenance costs.

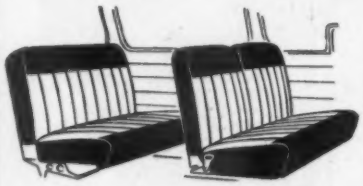
Increased, Faster Flap Travel, New Beechcraft Propeller

Improved short field take-off and landing performance is made possible by greater degree of flap travel and the greater static thrust of the new Beechcraft propeller.



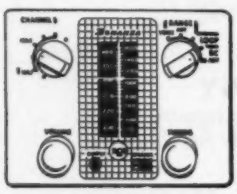
Faster Landing Gear Action — Both Up and Down!

The already quick action of the Bonanza's retractable tricycle landing gear has been speeded up even more. At 105 mph the gear lowers in 7½ seconds, goes up in 8½ seconds!



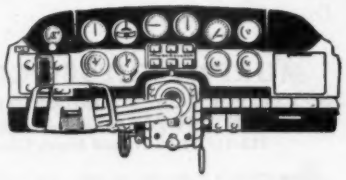
New Upholstery Combinations and Interior Designs

New combinations of blue, green and brown materials of warmth and beauty especially chosen to blend with the new range of exterior colors. Smart leather seat caps, new arm rests for all passengers.



New Radio Includes VHF Marker Beacon

The selection of the RCA 116 transceiver as standard equipment provides regular low-frequency operation for navigating four-course radio range, homing on range and standard broadcast stations; adds VHF channels.



New Instrument Panel Design, Safety-Type Wheel

New instrument panel design retains famous Bonanza operating convenience and efficiency, adds smarter-than-ever note to cabin appearance. And there's a new safety-type control wheel to match!

It has no equal in performance, speed, economy, strength, safety, style and comfort!

The new B35 Beechcraft Bonanza exceeds all promises for a speed-with-economy plane that's roomy, comfortable and easy to fly! New performance features at moderate horsepower add to its versatility and safety, hold operating and maintenance costs at a *business economy* level! New operating conveniences and luxury appointments plus scores of refinements call for a personal inspection because there's room here to show only a few. See it! Get all the facts! You'll agree this greater-than-ever Beechcraft Bonanza is a better-than-ever value!

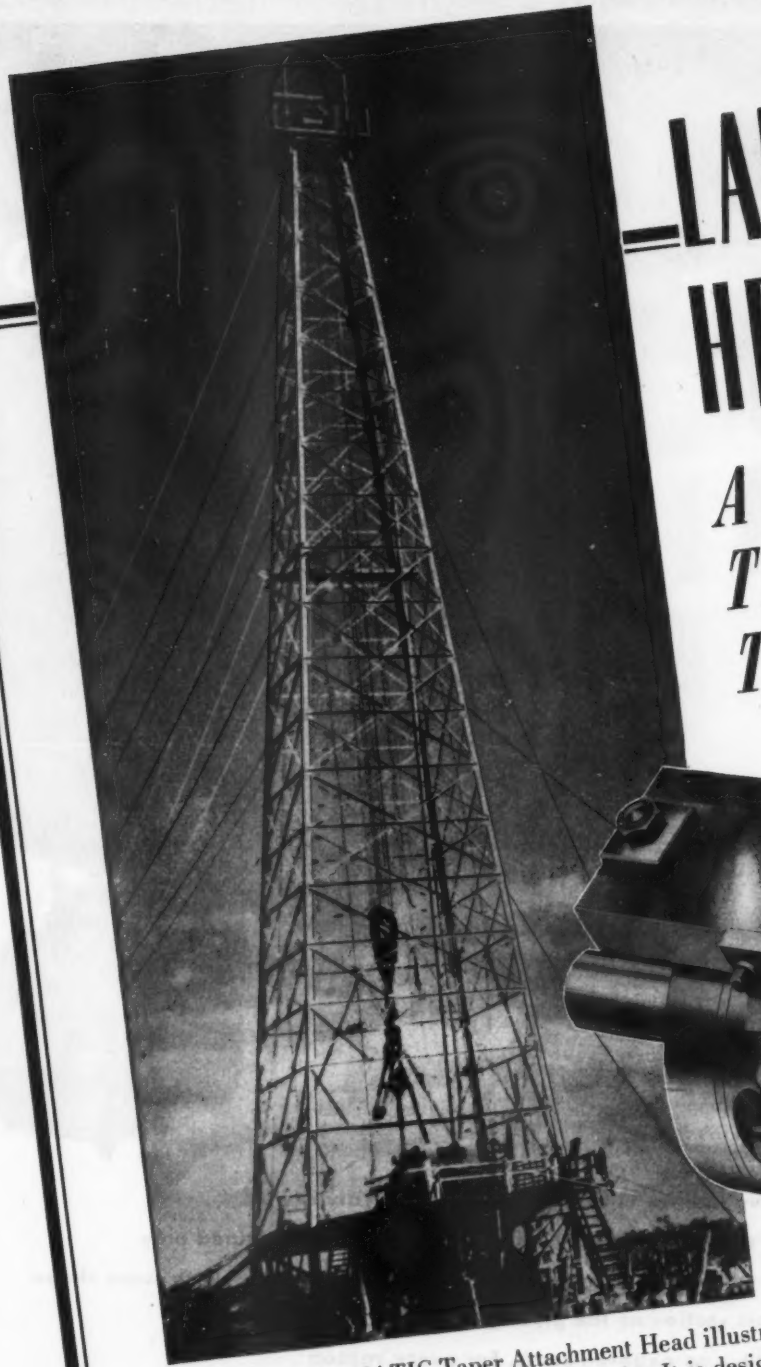
Top speed, 184 mph
Cruising speed, 170 mph
Range, 750 miles
Fuel economy, 9.5 gph

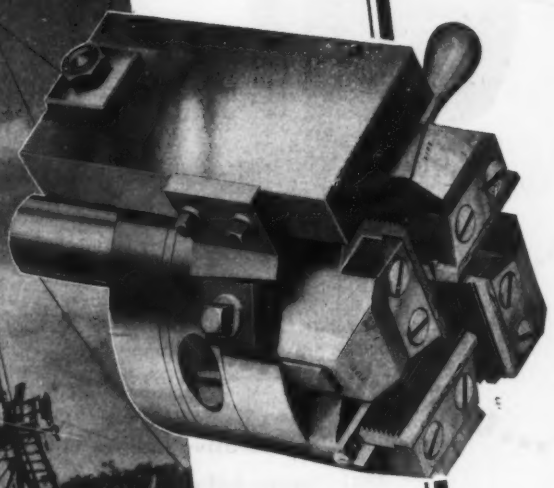
Get all the facts! There are hundreds more — about the extra advantages of the new Model B35 Beechcraft Bonanza. Check with your nearest Beechcraft distributor or dealer, or write for complete information on your company letterhead to Beech Aircraft Corporation, Wichita, Kansas, U.S.A.

Beechcraft BONANZA

BEECHCRAFTS ARE THE AIR FLEET OF AMERICAN BUSINESS

LANDMATIC HEADS *for* ACCURATE TAPERED THREADS





● The 2" LANDMATIC Taper Attachment Head illustrated is widely used in the production of oil tubular goods. It is designed primarily to cut taper threads to exacting A.P.I. standards. The Taper Attachment by limiting cutting action to the throat section of the chaser reduces chaser wear and increases thread accuracy. *Write for Bulletin F-90.*

LANDIS MACHINE CO.
WAYNESBORO, PA., U. S. A.

Represented in the Domestic Oil Fields by: Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; C. J. Harter Machinery, Houston, Texas; Frederic-Baker Co., New Orleans, La.; Moore Machinery Co., Los Angeles and San Francisco, Calif.; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.

XUM

For abrasive ladings a.c.f. Lubricated Plug Valves with clear full circular ports* are ideal. Compact size is retained only through cylindrical plug design...straight-through flow with same shape and cross section as the pipe. Quick quarter turn to open or close...no exposed seats. For every reason a.c.f. Valves should be your first choice.

*Also offered with full area rectangular ports.

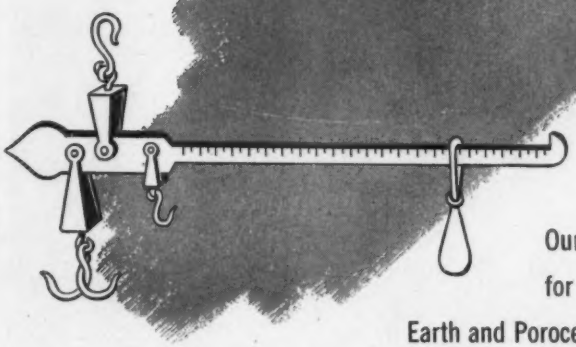
CYLINDRICAL FULL PIPE AREA LUBRICATED

a.c.f. PLUG VALVES

Representatives in more than 50 principal cities.

Ask for catalog 4-OG. American Car and Foundry Company, Valve Division, 30 Church Street, New York 8, New York.

How "heavy" is resourcefulness?



Ours would weigh nearly four billion pounds, for that's how much Attapulgus Fullers Earth and Porocel Activated Bauxite we've shipped to petroleum refiners.

When weighing resourcefulness—as it applies to percolation adsorbents and solid catalysts—two factors are particularly meaningful: First, the desire of all the people in the company family to tackle problems that require particular skill and broad technical knowledge. Second, the company's physical reach—mines, plant equipment, specialized laboratory and engineering facilities—for good men can do no more than their tools permit.

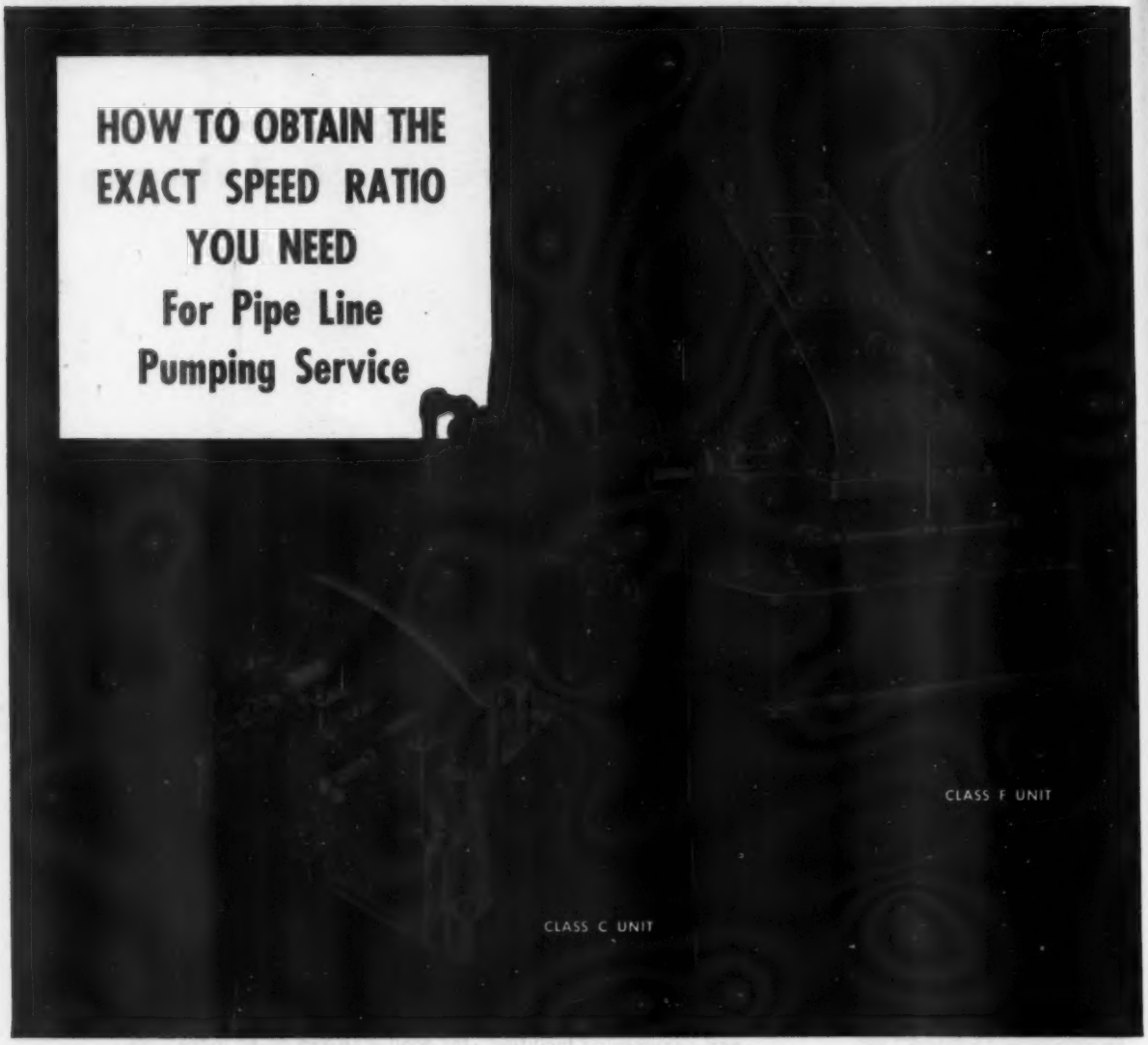
These resources abound at Attapulgus and Porocel. They dovetail to put a firm base under a completely integrated service. And—for world-wide petroleum refining—to put the right adsorbents to work under the right conditions.
May we be of service to you?

ATTAPULGUS CLAY COMPANY *Fullers Earth* · **POROCEL** CORPORATION *Activated Bauxites*

Dept. V, 210 West Washington Square, Philadelphia 5, Pa.

XUM

HOW TO OBTAIN THE EXACT SPEED RATIO YOU NEED For Pipe Line Pumping Service



From the Farrel® line of geared speed increasers you can obtain the exact ratio you require for stepping up engine or motor RPM to the desired pump speed. 49 standard sizes provide speed ratios ranging from 1:1 to 12:1. For higher ratios, units using two sets of gears are supplied with ratio range from 12:1 to 40:1.

Farrel speed increasers were the first to be developed in a standard series for pipe line pumping service. That was eighteen years ago, and the original units, as well as all of those installed since, are still in operation, performing as well as on the day they were put into service.

For full information about these time-proved speed increasers, write for your copy of Bulletin No. 448. No cost, no obligation.

FARREL-BIRMINGHAM COMPANY, INC., 344 VULCAN STREET, BUFFALO 7, N.Y.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y. *Sales Offices:* Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Cleveland, Detroit, Chicago, Los Angeles

OIL FIELD REPRESENTATIVES: Hercules-Lupfer Engine Sales Co., 124 N. Boston St., Tulsa 1, Okla.
V. W. Osborne, 822-A M & M Building, Houston 2, Texas

Farrel-Birmingham®

FB-566

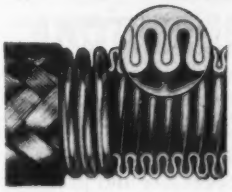
For troublesome connections . . .

CMH

FLEXIBLE METAL HOSE offers the economical, dependable solution

Scores of troublesome connection problems where there is movement between parts, misalignment, vibration or expansion and contraction are effectively solved with CMH Flexible Metal Hose. Manufactured in a variety of types and a variety of metals, CMH Flexible Metal Hose is available for pressures from vacuum to 12,000 psi (burst) and for temperatures from sub zero to 1600° F.

If you do not already have literature describing the CMH line of flexible metal hose products, write for it, today, mentioning the types of connection problems you have.



CMH corrugated metal hose is manufactured in steel, bronze, stainless steel and other alloys and is available with or without metal braid covering. Convoluted hose, conduits, expansion joints, bellows and specialty items are also included in the CMH line.

Flexon identifies CMH products that have served industry for over 48 years.

CHICAGO METAL HOSE Corporation

1345 S. Third Avenue • Maywood, Illinois • Plants at Maywood, Elgin and Rock Falls, Ill.
In Canada: Canadian Metal Hose Co., Ltd., Brampton, Ont.

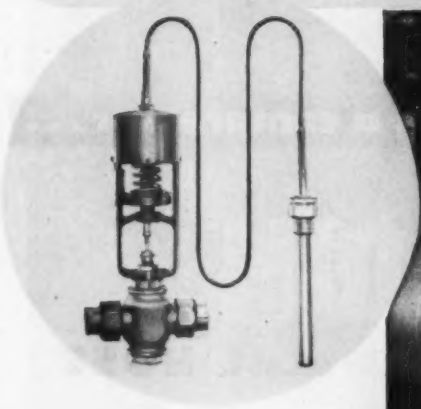
CMH

ONE DEPENDABLE SOURCE
for every flexible metal hose requirement

Convoluted and Corrugated Flexible Metal Hose in a Variety of Metals • Expansion Joints for Piping Systems
Stainless Steel and Brass Bellows • Flexible Metal Conduit and Armor • Assemblies of These Components

Automatic "brain" for emulsion heaters and treaters ... keeps temperature *constant*

Photo courtesy Black, Sivalls & Bryson, Inc., Kansas City, Mo.



SYLPHON THERMOSTAT No. 923-5. Valve sizes from ¼" to 1½". Reverse acting type available. Can be supplied with fin type bulb for controlling temperature of air or gases.

WHEN it comes to maintaining temperature as wanted in oil heaters and treaters, Sylphon Thermostat No. 923-5 does the job perfectly.

It makes sure the proper temperature for separating the water from the emulsion is *maintained*—day in and day out, automatically.

Thermostat No. 923-5 is simply constructed and self-operated. It has "stable" modulating control characteristics; there's no cycling or hunting in the discharge temperature. It has built-in, over-temperature protection; the thermostat assembly is safe-guarded against damage in the event the regulator bulb is subjected to above-limit temperatures.

Sturdily built, No. 923-5 operates practically maintenance-free—serves for years. Used as original equipment on most leading emulsion heaters and treaters.

Write for details. Or send for information about any of the complete Fulton Sylphon line of temperature and pressure controls. Ask for Catalog MO-A.

Temperature Controls • Bellows Devices • Bellows Assemblies

FULTON SYLPHON
DIVISION

FIRST WITH BELLOWS

ROBERTSHAW-FULTON CONTROLS CO., KNOXVILLE 4, TENN.

Canadian Representatives, Darling Brothers, Montreal

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XUM

full branch tees

½ INCH THROUGH 30 INCHES

Ⓛ TO MARK PROGRESS

ANOTHER IMPORTANT DEVELOPMENT in the LADISH LINE of

Controlled Quality FITTINGS

To increase safety, ease of installation and welding accessibility . . . Ladish Welding Tees have Full Branch Outlets with identical center-to-end dimension of branch and run as is required for each size *through 30 inches.* Scientific metal distribution . . . pioneered by Ladish . . . adds extra protection by equalizing stress over the entire fitting and assuring maximum strength in every cross section.

THE COMPLETE FITTINGS LINE
PRODUCED UNDER ONE ROOF...ONE RESPONSIBILITY

LADISH CO.

CUDAHY, WISCONSIN
MILWAUKEE SUBURB

DISTRICT OFFICES: New York • Buffalo • Pittsburgh • Philadelphia • Cleveland • Chicago
St. Paul • St. Louis • Atlanta • Houston • Los Angeles • Havana

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The THREDKOTES are a group of compounds developed especially for various types of threaded connections used in the petroleum industry and *field-tested to give your threads longer life.*

On highly-machined threads, THREDKOTE prevents galling, acts as a lubricant. On loose or worn threads, there's a THREDKOTE that seals the joints, works well under pressure and load.

Wherever you use threaded pipe, also use a Humble THREDKOTE to save the threads and seal the joints.

THREDKOTE

is sold by

HUMBLE OIL & REFINING COMPANY, Houston, Texas

THE CARTER OIL COMPANY, Tulsa, Oklahoma

and leading oil field supply houses everywhere.

THREDKOTE 701	**THREDKOTE 702**	**THREDKOTE 705**	**THREDKOTE 708**
For extreme pressure connections, oil well casing and tubing, tool joints.	For Christmas Tree assemblies, steam lines.	For extreme and high pressure connections.	For air lines, bolted tanks, gas and gasoline lines, gasket seals, oil well casing and tubing, permanent sealer.

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FIRST STEAM HOSE TO GIVE OVER 2000 HOURS CONTINUOUS SERVICE

at 200 lbs. Working Pressure!

Steam Hose users have long been stymied by the costly problem of tube-swelling during normal service life of ordinary hose. They turned to BWH for the solution.

BWH came up with the answer . . . CONCORD #20! In building this revolutionary new hose, the rubber tube was first locked securely between two braids of high tensile steel wire. The cover and static wires were added. Then the new construction was subjected to a *continuous flow* of 200 lbs. working pressure *for over 2000 hours!* At the end of this record-smashing test, the tube showed no evidence of hardening or swelling! Couplings were re-attached without the slightest difficulty because the original inside diameter of the tube was maintained throughout!

In addition to its many other advantages, Concord #20 features a specially treated cover which protects it against oil, grease, heat, strong sunlight and abrasion!

HAVE YOU A JOB WHERE STAMINA COUNTS? Bring us your toughest problems. We're specialists in solving them. Consult The Happy Company, Tulsa, Oklahoma.

Industrial Hose
Rubber Belting
V-Belts
V-Belt Sheaves
Power Transmission Equipment

The HAPPY COMPANY
Formerly HARRY BELTING COMPANY
TULSA, OKLAHOMA

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Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in all Principal Cities

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For Quiet Engine and Compressor Operation

Install BURGESS-MANNING SNUBBERS

To reduce engine exhaust and compressor intake noises, Burgess-Manning Snubbers are the answer. Turbulent slugs of hot exhaust gas or incoming pulses of air are snubbed so that the oscillating flow of gas, which causes noise, is smoothed to a unidirectional flow without appreciable restriction. The flow of gas from the engine, or the flow of air into the engine or compressor becomes smooth and quiet.

For a solution of your noise or gas surging problems, consult Burgess-Manning engineers.

APPLICATIONS

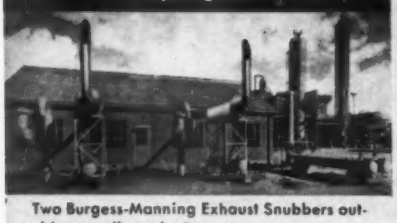
- Drilling
- Oil well pumping
- Crude oil and product pipe lines
- Gas transmission
- Repressuring
- Recycling
- Refineries
- Gasoline plants

Burgess-Manning Snubbers on Fluid Catalytic Cracker

SDG Slug Buster Snubber

From the Producing Well, through the Refinery Gate . . . It's Burgess-Manning

Recycling Plant



Two Burgess-Manning Exhaust Snubbers outside recycling plant.

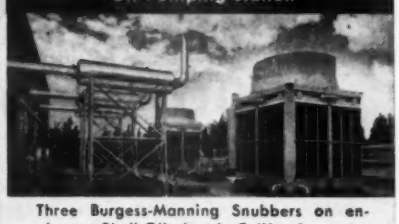
Pipe Line

Burgess-Manning Exhaust Snubbers on pipe line engines.

Rotary Drilling Engines

Burgess-Manning Snubbers on rotary drilling engines at Shawnee Drilling Co., Shawnee, Oklahoma.

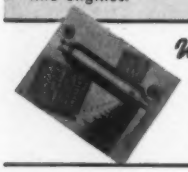
Oil Pumping Station



Three Burgess-Manning Snubbers on engines at Shell Oil plant in California.

Portable Drilling Rig

Portable oil rig using Burgess-Manning Snubber.

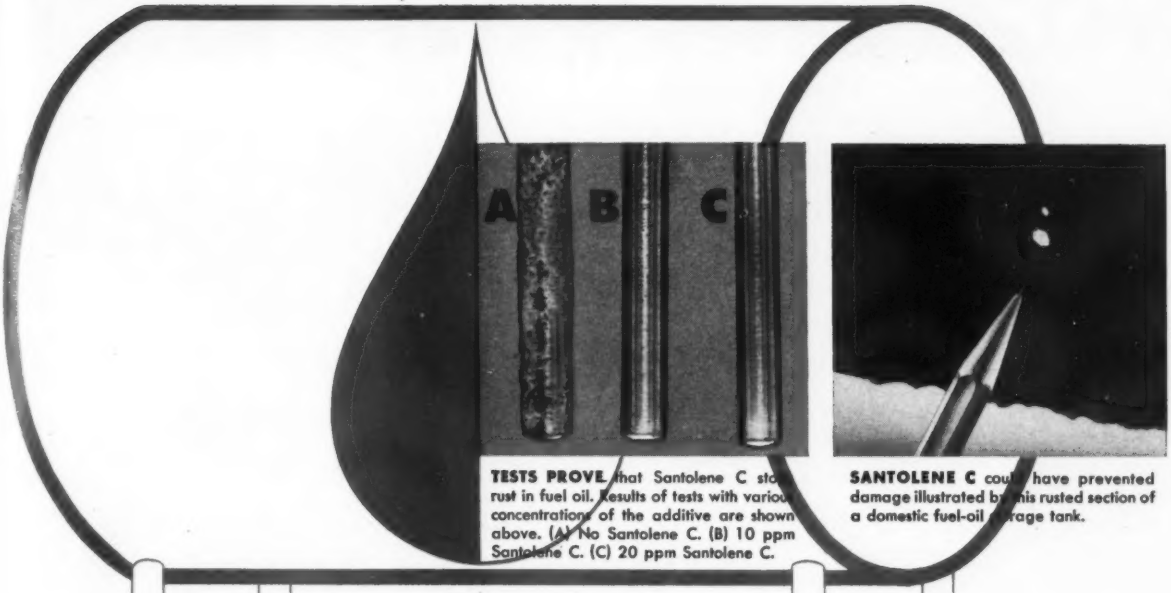


Write for Bulletin

Bulletin No. 497 features Burgess-Manning's new SDG Slug Buster Snubber.

BURGESS-MANNING COMPANY

LIBERTYVILLE, ILLINOIS



TESTS PROVE that Santolene C stops rust in fuel oil. Results of tests with various concentrations of the additive are shown above. (A) No Santolene C. (B) 10 ppm Santolene C. (C) 20 ppm Santolene C.

SANTOLENE C could have prevented damage illustrated by this rusted section of a domestic fuel-oil storage tank.

SANTOLENE C *STOPS RUST*

and gives your fuel oil a sales-making quality

Tell your fuel oil customers that your product prevents rust in their storage tanks and you'll get a larger share of the fuel oil business.

You can make that statement . . . and your oil can back it up with performance . . . if you add a minute quantity of Monsanto Santolene C to your product.

Santolene C stops rust . . . *economically*. The cost of inhibiting rust in a 42-gallon barrel of fuel oil usually is less than two-tenths ($0.002) of a cent.

Mail the coupon for details on how Santolene C can prevent rust in pipe lines and tanks . . . how it is effective in fuel oil, gasoline or any type of light petroleum product. MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1745-F South Second Street, St. Louis 4, Missouri.

Santolene: Reg. U. S. Pat. Off.

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CHEMICALS AND PLASTICS

MONSANTO CHEMICAL COMPANY
Organic Chemicals Division
1745-F South Second Street, St. Louis 4, Missouri

Please send information on Santolene C, rust-inhibiting additive for light petroleum products.

Name..... *Title*.....

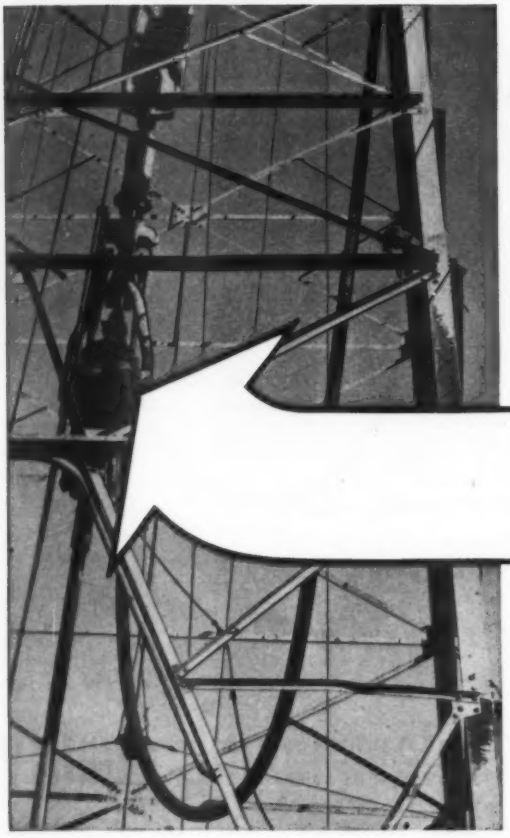
Company.....

Street.....

City..... *Zone*.... *State*.....

SERVING INDUSTRY . . . WHICH SERVES MANKIND

This Modern Rotary Hose is



Five Ways Better

It's "only the beginning" for this Ray-Man Rotary Hose. When photographed it had drilled 18,400 feet of hole in 3 months of service in Mississippi.

You Can Reduce Drilling Costs with Ray-Man Rotary Hose and Type "E" Couplings

1. SUPER-FLEXIBILITY is the basic improvement of Ray-Man Rotary Hose over usual constructions which are heavy and stiff. Manhattan engineers designed a machine to wind high tensile steel-wire under precisioned tension, making possible an entirely new principle of strength in Rotary Hose.

2. STEADINESS in the derrick under working conditions is another Ray-Man characteristic that means longer hose life and reduced costs. The new Ray-Man strength member resists pulsations under pressure.

3. EASIER HANDLING means less danger of damage in trucking from hole to hole and making-up to standpipe and swivel.

4. OIL-PROOF FLEXLASTICS TUBE insures long hose life for all methods of drilling, including oil or oil-base mud.

5. MODERN COUPLING HAS PRESSURE-SEALING FLANGE. Finally, the *Streamlined Type "E" Coupling* features the "Lip-Lok" Pressure-Sealing Flange. The higher the pressure, the tighter the seal. The assurance this gives you against dangerous blow-outs is another important consideration in buying rotary hose that will reduce drilling costs. Make your next hose be your best hose buy. Try Ray-Man Rotary Hose with Type "E" Coupling.

RAYBESTOS - MANHATTAN PRODUCTS FOR PETROLEUM
Have you asked for your copy of our latest catalog? It describes Rotary Hose in detail with V-Belts, Flat Belts, Brake Blocks, Packing, and other products for the Petroleum Industry.

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Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose • Fan Belts • Brake Linings • Brake Blocks • Clutch Facings • Packings • Asbestos Textiles • Powdered Metal Products • Abrasive & Diamond Wheels • Bowling Balls

CONTINENTAL RED SEAL ENGINES

... BETTER SERVICE BACKING THAN EVER BEFORE

Continental Motors recognizes and accepts the duty imposed upon it by the oil field's steadily-growing preference for Continental Red Seal power — the obligation to maintain service facilities on a par with the product itself. One of its major objectives since the end of the war has been the expansion of its parts and service network, not only in the United States, but wherever Red Seal engines are in use.

Today, no matter where you are, there's a dealer near you with factory-trained mechanics and genuine Red Seal parts, and fully-stocked warehouses at Dallas, Los Angeles and Muskegon—less than 24 hours away by air express—ably back him up.

You may not need service for years, but it's good to know that when you do, it's as near as your phone.

SEE OUR CATALOG IN COMPOSITE CATALOG

Continental Motors Corporation

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3 NEW LIGHTWEIGHT—

STRONGER Stainless STEEL

FIRE EXTINGUISHERS

Foam, Soda-Acid, Water Types

WITH NEW INDESTRUCTIBLE *LABELS IN COLOR . . . AN INTEGRAL PART OF THE SHELL, UNREMOVABLE, MORE LEGIBLE, MORE EASILY CLEANED!

Approved by Underwriters' and Factory Mutuals Laboratories

Alfco engineers have utilized the strength, the lightness, the dependability, and the indestructibility of modern stainless steel to make this sparkling new series of 2½ Gallon Alfco Fire Extinguishers, the finest in their price class.

They are twice as strong as the old style fabricated copper units; about 50% lighter in weight without the charge; will retain their luster indefinitely; have new color label (patent pending) that is an integral part of shell, assuring lasting legibility of operation instructions.

All welded construction, elbow and collar silver brazed, no lead solder banks, no acid fluxes, corrosion resistant, both inside and out — a revolutionary improvement in fire extinguisher construction.

All 3 types are available: Firefoam 5F2, for Class A fires (Paper, Wood, Rubbish, etc.) and Class B fires (Flammable Liquids, Gasoline, Oil, Grease, Paint, etc.). Soda-Acid 5S2, for Class A fires, and Water Type 5H2, for Class A fires.

* Label Patent Pending

Tested to 500 Lbs.

ALFCO
TRADE MARK

AMERICAN-LAFRANCE-FOAMITE Corporation
ELMIRA NEW YORK U.S.A.

Proud to carry on the Tradition of LEADERSHIP in FIRE PROTECTION

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This HOMESTEAD VALVE opens or closes instantly . . . every time . . . any time

IT'S STICK-PROOF BECAUSE IT'S LEVER-SEALD

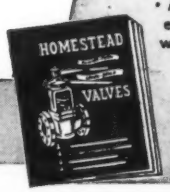
HOMESTEAD LEVER-SEALD QUARTER-TURN VALVES have been first choice for more than 16 years in services where extremes of temperature or pressure, or corrosive fluids, cause ordinary valves to "stick" or "seize".

They are "stick-proof" because built into each valve is a powerful lever-and-screw device that prevents sticking and assures positive action at all times under all conditions.

They operate faster too, than screw-stem type valves . . . 16 to 28 times faster. And the quarter-turn principle makes them ideal for installation in restricted areas, next to walls, floors, ceilings, congested piping and other obstructions where other types of valves could not be used. Next time you have a sticking or damaged valve replace it with a Homestead LEVER-SEALD Quarter-Turn Valve. You'll never be satisfied with ordinary valves again.

Homestead Lever-Seald Quarter-Turn Valves are available in metals and alloys to suit your needs in sizes from $1\frac{1}{2}$" to 10" for pressures from vacuum to 1500 lbs.

- **Instant Stick-Proof Operation.**
- **Quarter-turn fully opens or closes.**
- **Seating surfaces always protected. Corrosion practically eliminated.**
- **Unobstructed straight-line fluid flow.**
- **All moving parts protected from effects of service conditions and weather.**



For full particulars send for "Valve Reference Book No. 39-3." Write today.

HOMESTEAD VALVE MANUFACTURING CO.

"Serving Since 1892"

P. O. Box 403 **Coraopolis, Pa.**

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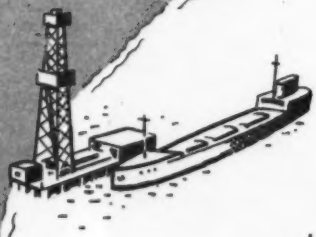
ONE-STOP SERVICE

Gulf Coast too!

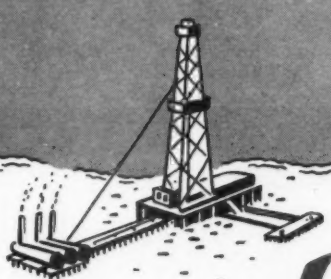


The "Thumb Man" means ONE-STOP supply service wherever you see him. This is particularly true on the Gulf Coast

Here operations are extremely complicated and costly. Every minute counts; every dollar must do extra duty. For these reasons our Gulf Coast stores are heavily stocked with the best available materials and equipment to meet the requirements of the work involved.

To get the most from every dollar, to save valuable time: Take advantage of the ONE-STOP supply service of your nearest Jones & Laughlin Supply store. Start today.

SUPPLY FOR THE



From Canada south there are 79 Jones & Laughlin Supply stores. Six of these are located directly on the Gulf Coast.

Texas

Beaumont
Corpus Christi
Houston

Louisiana

Harvey
Houma
Lake Charles

Jones & Laughlin Supply Company

Subsidiary of
Jones & Laughlin
Steel Corporation

J&L STEEL

TULSA, OKLAHOMA

"... here's *MY* warehouse!"

EXPORT: 230 PARK AVE., NEW YORK 17, N. Y., U. S. A.

XUM

WHALE OF A STORY

Once **oil**, and whale **oil** at that, was used primarily for lighting lamps like this. Today **oil** provides over 40% of the energy needed to run the entire world. That, in sum, is the history of the development of the mammoth **Oil** Industry. It's a whale of a story in which steel pipe is the hero—and in which Wheatland's "pipe with the yearmark" today is playing an important role.

WHEATLAND TUBE COMPANY

1300 Bankers Securities Bldg., Juniper and Walnut Streets, Philadelphia 7, Pa.

There is no finer steel pipe made than Wheatland's *"pipe with the yearmark"*.

HERE'S WHAT THE KEY IN OUR TRADE-MARK MEANS

ARTHUR G. McKEE & COMPANY offer many engineering services to petroleum refiners—but only *one* standard of engineering.

That single standard of quality has always been the key to McKee success in the design, engineering and construction of petroleum processing facilities in all quarters of the globe.

McKee policy requires that we execute every project to the best of our ability, at the lowest possible cost *consistent with correct design, thorough engineering and sound construction.*

ARTHUR G. McKEE & COMPANY

DESIGN, ENGINEERING AND CONSTRUCTION FOR THE PETROLEUM REFINING AND IRON AND STEEL INDUSTRIES

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FREE FOLDER!

Actual color samples and finishes show how the 15 basic "Coro-Gard" coating systems can give long-lasting protection to metal.

Just off the presses!—An informative new folder that shows you how you can solve your metal coating problems with "Coro-Gard." It gives you 15 basic metal protective systems, together with actual color samples of anti-corrosion, flat finish, anti-fouling, glossy finish and anti-skid coatings.

Mail the coupon below for your copy of this valuable folder. Learn why equipment subject to corrosion and abrasion lasts longer, requires less maintenance when "Coro-Gard" is on the job.

FOLDER SHOWS CORRECT "CORO-GARD" COATINGS FOR METAL SUBJECTED TO—

1. **Severe Fresh or Salt Water Exposure**
2. **Chemical Fumes & Spillage**
3. **Sour Crude Petroleum & Gasoline**
4. **Abrasion**
5. **Normal Exposure**

AND MANY OTHERS

LATEST AID to metal coating problems is this folder of "Coro-Gard" color samples and protective systems. Handy chart shows 28 different finishes and colors to help you solve your *specific* problem. Mail coupon today.

WHATEVER your corrosion problem, there's a "Coro-Gard" Coating System to save you time and money. Our engineers have prepared metal coating systems to satisfy every need. Mail coupon for informative folder.

Minnesota Mining & Mfg. Co.
Adhesives & Coatings Division
411 Piquette Avenue
Detroit 2, Michigan

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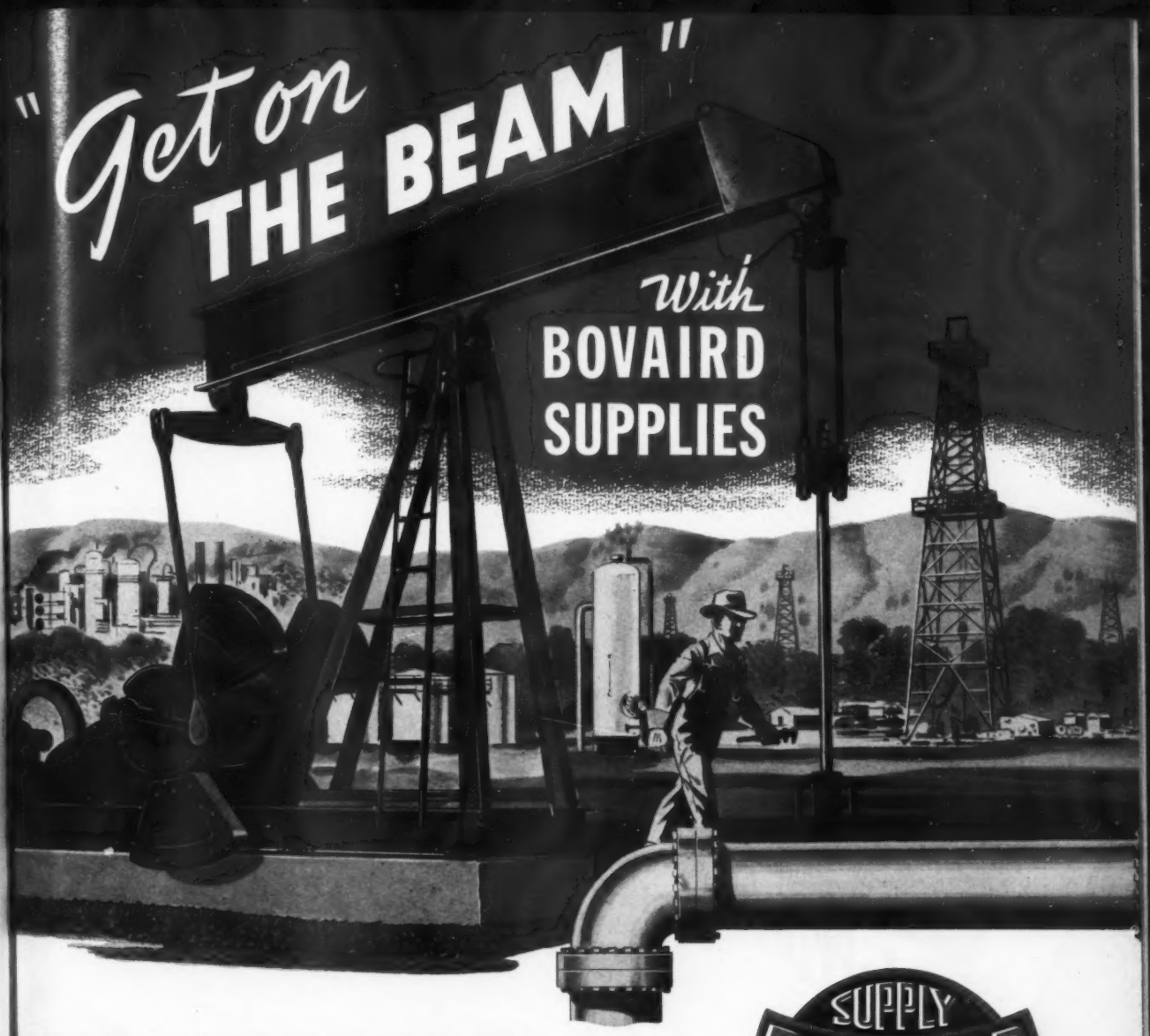
WRITE TODAY for handy folder showing how to cut the cost of treating equipment, prolong the interval between coating and re-coating. Address our Adhesives and Coatings Division in Detroit.

Made in U.S.A. by MINNESOTA MINING & MFG. CO., ADHESIVES AND COATINGS DIV., 411 Piquette Ave., Detroit 2, Mich. Also makers of "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Undersseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-Slip Surfacing, "3M" Abrasives. General Offices: Saint Paul 6, Minnesota.

General Export: Durex Abrasives Corp., *New Rochelle, N. Y.* • *In Canada:* Canadian Durex Abrasives Ltd., *Brantford, Ontario.*



From derrick or draw works, pump jack or polished rod — whatever your oil field equipment needs, you'll get fast service when you "Buy From Bovaird." Bovaird's conveniently located stores in Kansas, Illinois, Texas and Oklahoma are fully stocked to meet your needs; ably manned by experienced personnel; geared for efficient service from the beginning of your job to its successful completion. Make the Bovaird store nearest you your supply headquarters.

"Buy From Bovaird"

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GENERAL OFFICES
TULSA, OKLAHOMA

Eastman

ORIGINATORS of

CONTROLLED DIRECTIONAL DRILLING

Millions OF BARRELS OF OIL RECOVERED BY Eastman DIRECTIONAL DRILLING!

This is not fantastic...in over 20 years of experience millions of barrels of oil have been recovered by the use of Eastman controlled directional drilling service. Not only has directional drilling made possible the exploitation of new oil reserves, but it has assisted in recovering huge amounts of oil previously inaccessible.

Methods, techniques, and specialized tools developed and perfected by Eastman make it possible to direct accurately the course of the hole in any desired direction toward any predetermined objective. Eastman engineers, in applying this specialized science of directional drilling help the oil operator avoid large losses in time and money.

They also aid him in solving such specific problems as sidetracking obstructions in the hole, straightening the hole, and deflecting the course of the bore to reach otherwise inaccessible bottom locations.

A few of the difficult sub-surface problems to which directional drilling can be applied are: exploiting new sources of oil; redrilling old wells profitably; exploring geological structures from a single location; controlling wild wells; and drilling to sub-sea bottom locations from beach or artificial islands. Eastman engineers are prepared to help you anytime with your directional drilling problems.

Call the Eastman office nearest you.

SEE OUR CATALOG IN COMPOSITE CATALOG

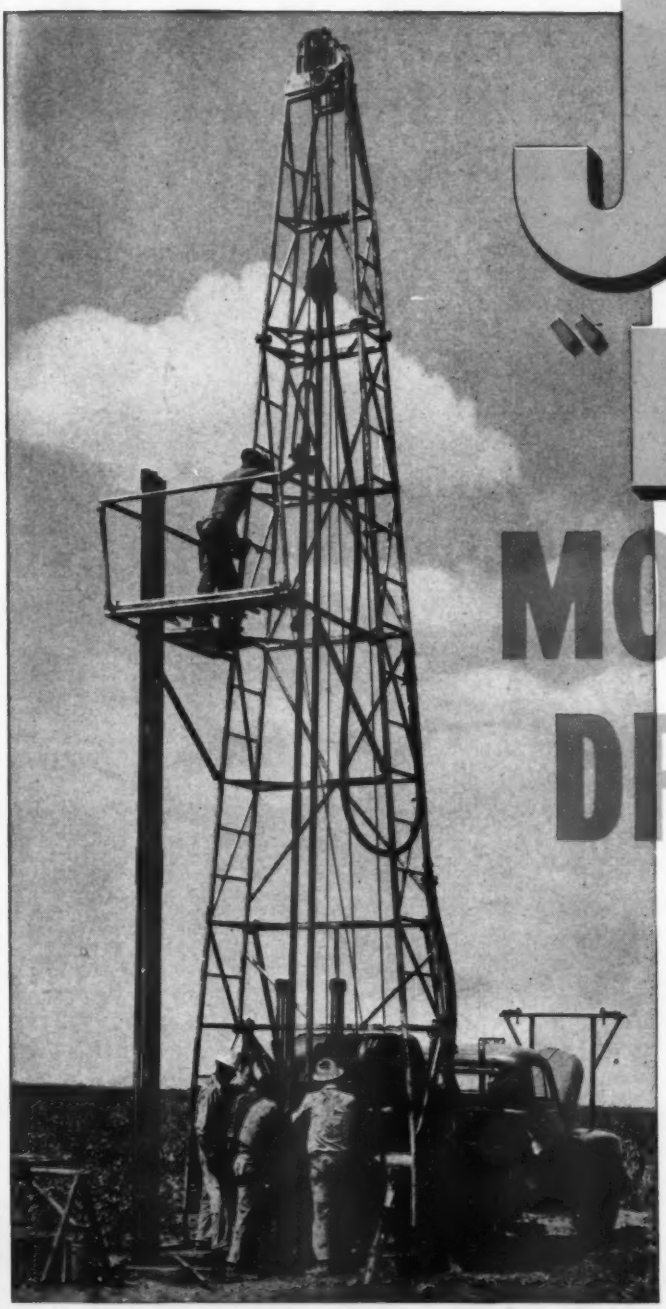
1950 OUR 20TH ANNIVERSARY YEAR

Eastman OIL WELL SURVEY COMPANY

DENVER
LONG BEACH
HOUSTON

Light! Highly Mobile! Fast-Drilling!

JOY "150" MOTORIZED DRILL RIG



For medium-depth structure testing, core or water-well drilling, etc., the JOY 150 tops the field. Unitized design, easily adjusted or repaired. Incorporates such desirable features as oil-bath lubricated chain drives, retractable rotary table for handling casing, reversible rotary mechanism, built-in PTO drive, automatic chuck, etc. Available with single or double-drum hoist, and with or without hydraulic feed, to give you maximum hole footage per day in its class! ● Complete line of Drill Rigs to 5000 feet.

WRITE FOR BULLETIN OR

Consult a Joy Engineer

W&D O 3000

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

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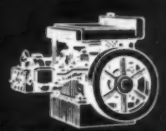
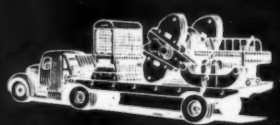
LUFKIN

Conventional installation of Lufkin Unit with Lufkin Cooper-Bessemer horizontal gas engine drive—a Lufkin completely engineered—single responsibility installation.

LUFKIN
PUMPING UNITS



LUFKIN-COOPER-BESSEMER
ENGINES



LUFKIN OIL FIELD AND INDUSTRIAL
TRUCK TRAILERS

INDUSTRIAL SPEED REDUCERS
AND INCREASERS

LUFKIN FOUNDRY AND M

Manufacturers of Lufkin Pumping Equipment—Lufkin Cooper-Bessemer Gas Engines—oil field and industrial truck-trailers of all types—industrial speed reducers and increasers, and commercial gray iron casting.

NO FIELD TOO DEEP!
NO FIELD TOO SHALLOW!

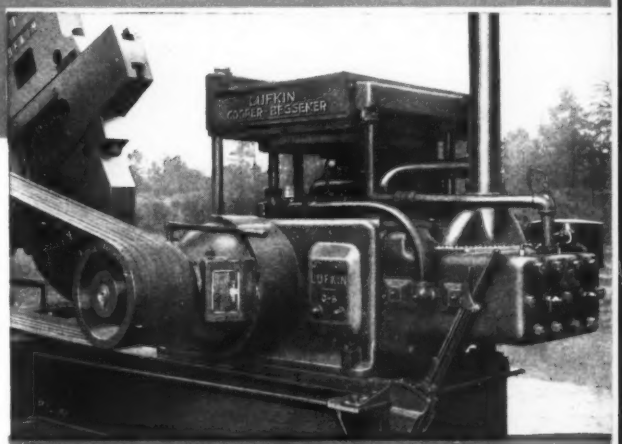
THERE IS A LUFKIN PUMPING UNIT FOR EVERY WELL DEPTH AND EVERY FIELD CONDITION

WORLD-WIDE recognition of the rugged dependability and high efficiency of Lufkin Pumping Units places Lufkin equipment first in every oil field of the world!

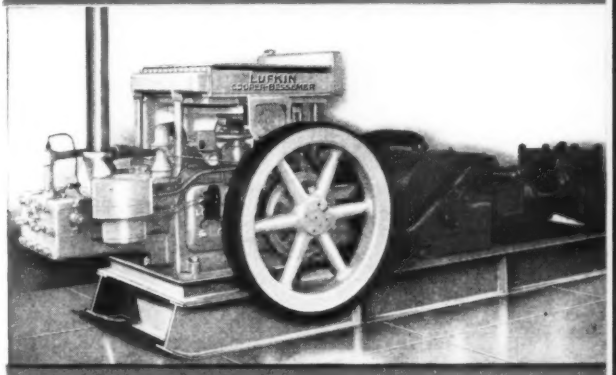
Lufkin Pumping Units have an especially high appeal for the foreign operator for the reason that few, if any, repairs and adjustments are needed after the unit passes Lufkin's rigid inspection system. Rugged, trouble-free, low-maintenance cost, Lufkin units mean lowest operating expense and highest productive service.

Lufkin pioneered and developed the application of reduction gears for oil well pumping service. A reasonable estimate is that there is more Lufkin pumping equipment in operation today than all others combined.

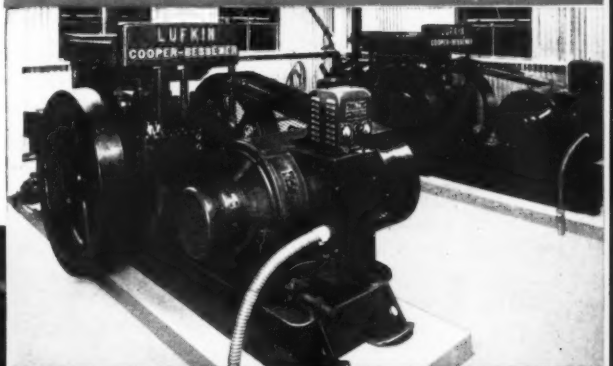
Lufkin equipment for the oil fields of the world is manufactured in Lufkin, Texas. Branches in principal oil fields.



Lufkin Cooper-Bessemer Horizontal Gas Engine—40-60 H.P. two cylinder two cycle 400-600 R.P.M



Lufkin Cooper-Bessemer Engine and Pump assembl



Lufkin Cooper-Bessemer G. S. D. H. Engine Drive generator installations.

DIVISION LUFKIN FOUNDRY & MACHINE COMPANY
INDUSTRIAL, MILL AND AUTOMOTIVE SUPPLIES

D MACHINE CO. Lufkin, Texas, U.S.A.

Branch sales and service: Houston, Dallas, Tulsa, Los Angeles, New York, Seminole, Oklahoma City, Corpus Christi, Odessa, Kilgore, Wichita Falls, Casper, Great Bend.

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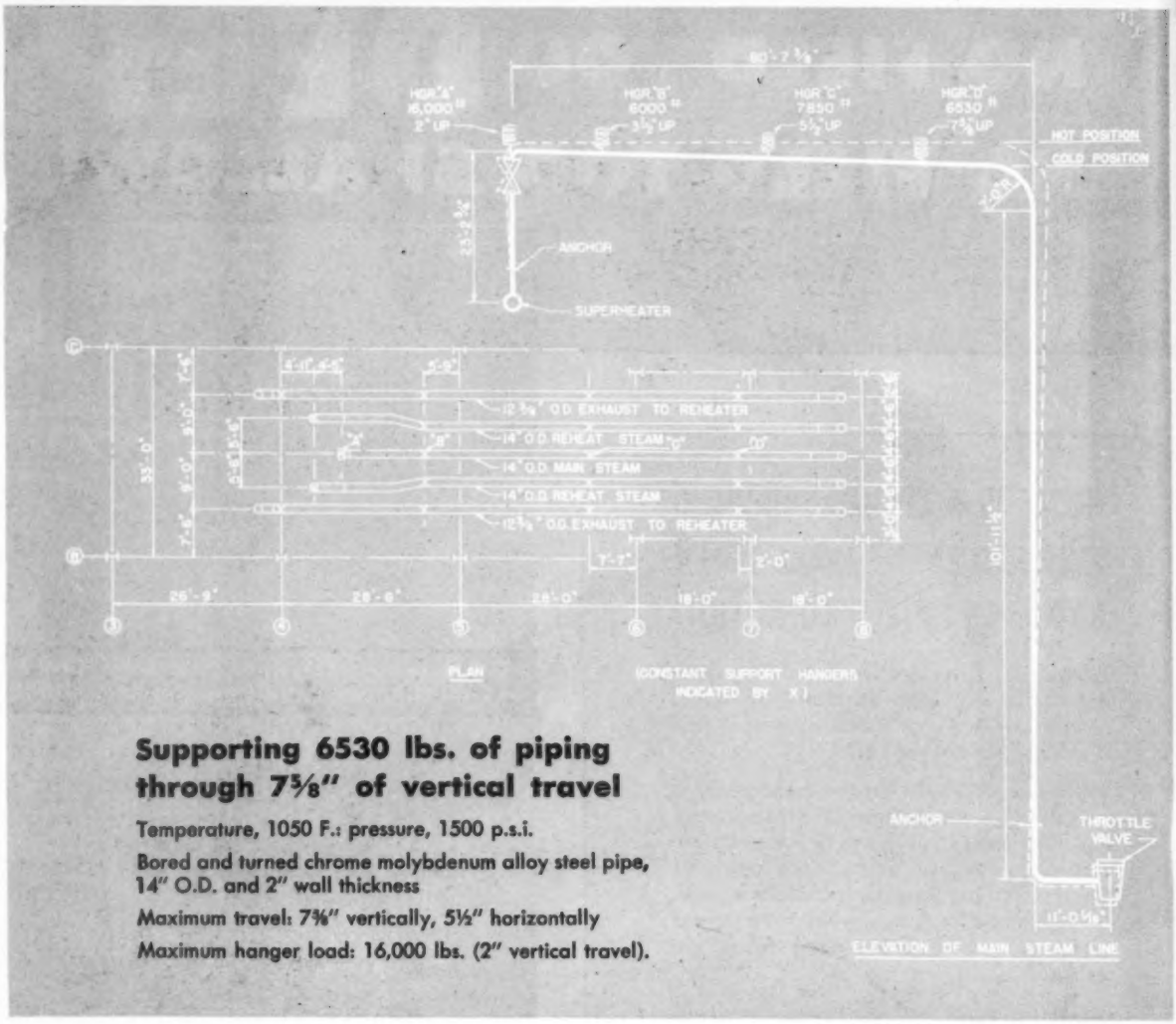


Supporting 6530 lbs. of piping through 7⅜" of vertical travel

Temperature, 1050 F.; pressure, 1500 p.s.i.

Bored and turned chrome molybdenum alloy steel pipe, 14" O.D. and 2" wall thickness

Maximum travel: 7⅜" vertically, 5½" horizontally

Maximum hanger load: 16,000 lbs. (2" vertical travel).

ONLY a Grinnell Constant-Support Hanger solves this problem easily, practically

Provides constant support to piping subject to vertical movement — in all hot and cold positions. Maintains full safety factor in supporting high temperature, high pressure piping. Non-resonant and energy absorbing. Mass-produced from standard precision parts. Individually calibrated for each installation. Load-adjustment features incorporated into design. Models to meet entire range of load-travel specifications. Minimum headroom required.

Believing that a good piping job is too important to be jeopardized by improvised or inadequate pipe hangers, Grinnell has developed a complete line of stock hangers and supports for every piping need from a simple water pipe to a high pressure, high temperature steam line. Write for Catalog 10-D.

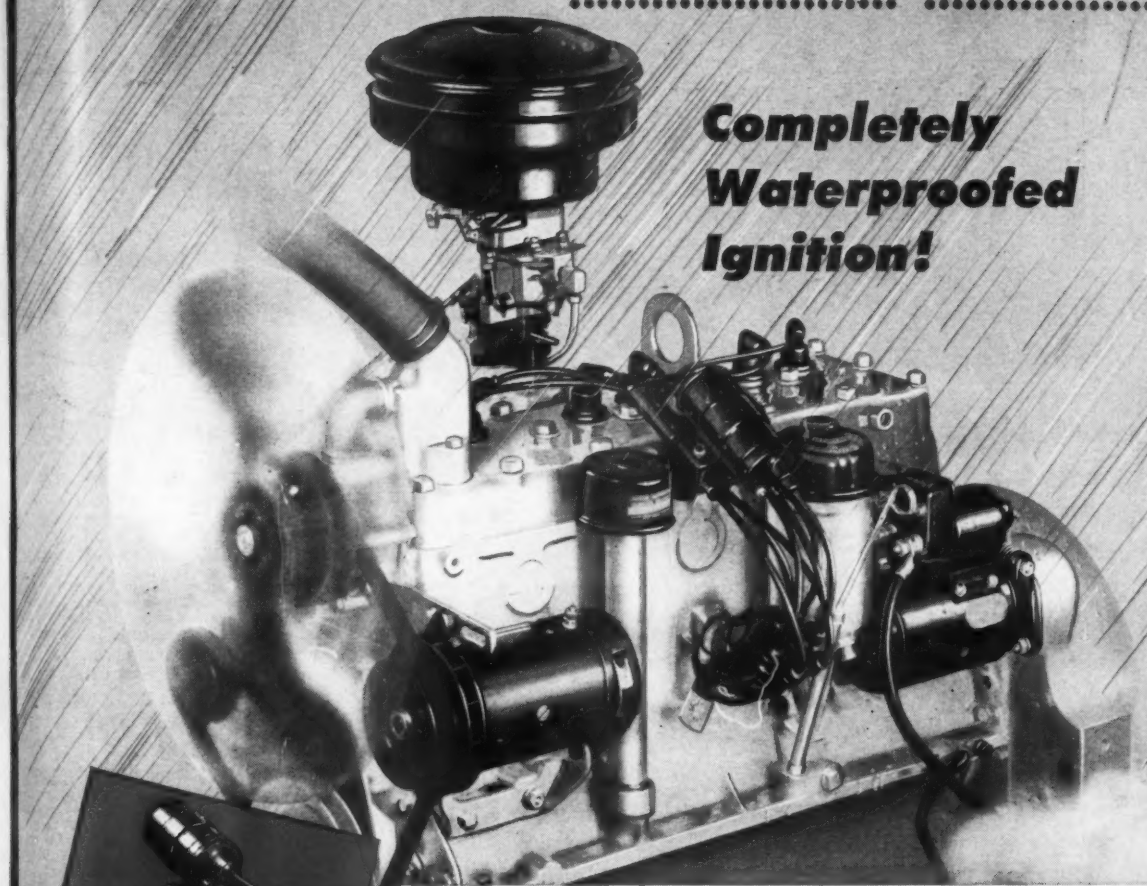
100th ANNIVERSARY — WHEREVER PIPING IS INVOLVED

GRINNELL

Grinnell Company, Inc., Providence, R. I. Branches: Atlanta • Billings • Buffalo • Charlotte • Chicago • Cleveland • Cranston • Fresno • Kansas City • Houston • Long Beach Los Angeles • Milwaukee • Minneapolis • New York • Oakland • Philadelphia • Pocatello • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane

NOW-ANOTHER FIRST

FOR CHRYSLER INDUSTRIAL ENGINES!



Completely Waterproofed Ignition!

• Distributor and coil are of waterproof construction. All wiring terminals are protected by rubber caps.
• Plated steel spark plug covers and neoprene synthetic rubber cap for terminal seal protect insulators from splashed water, oil, dust or dirt.
• Neoprene-covered spark plug wiring sheds water—will not absorb moisture.

IN WEATHER which causes other engines to cough, sputter, stall or foul out, a Chrysler Industrial Engine *keeps right on running.* You won't lose production time —drying out the ignition system of a Chrysler—*even if you turn a hose on it!*

Coil, distributor, wiring harness, spark plugs are *waterproofed* to prevent moisture from causing short circuits.

Waterproof ignition is typical of the many extra values you get in a Chrysler Industrial Engine. Extra values which explain why Chrysler Industrial Engines outperform, out-last and out-economize similarly rated engines on all sorts of jobs everywhere. Yet, thanks to Chrysler mass production economies you can buy a Chrysler Industrial Engine for *less money*—and get quick service *anywhere.*

See your dealer or write us.
Industrial Engine Division, Chrysler Corporation, Detroit 31, Michigan.

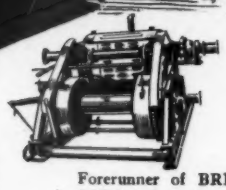
CHRYSLER

Industrial Engines and Power Units

HORSEPOWER WITH A PEDIGREE

BREWSTER *N-7* DRAWWORKS

FOR DRILLING TO . . . 8,500′



Forerunner of BREWSTER drawworks is the Early 1932 Model—heavy duty winch equipped with line shaft that could drill 3,000′

. . . BUILT WITH THE *E-FACTOR* . . . EXPERIENCE

THERE IS A REASON WHY THE BREWSTER N-7 DRAWWORKS IS TOP CHOICE . . . It has power . . . portability . . . economy . . . and MORE. It has 40 years experience wrapped-up inside. Back in 1910 the industry, still in short pants, had respect for Brewester design and fine drilling equipment because . . .

BREWSTER N-7 drawworks, 600 h.p. transmission. Has four forward speeds, one reverse, makes eight drum speeds and four Rotary speeds.

Brewster Engineers have been in the past and are today in direct contact with the men that use the equipment. With one foot at the drawing board and the other in the field, Brewster Engineers are constantly applying new advanced engineering design to information gathered from the vast experiences of contractors and toolpushers. THAT'S WHY BREWSTER MATCHED DRILLING EQUIPMENT is the best you can buy for

MAXIMUM EFFICIENCY AND PROFIT

The Brewster N-7 is portable • in one operation it can be moved • all friction clutches are accessible from the outside • is easily operated at eight drum speeds • all bearings and chains are oil lubricated • The N-7 has more power than any drawworks in its class • built for safety and economy.

"There's no 30 to 40 minutes 'shut - down - time' to re-oil and lubricate a Brewster N-7, my choice for a drawworks with speed—built to take it."

For detailed information write or wire your nearest supply house or—

THE BREWSTER COMPANY, Inc.

SHREVEPORT, LOUISIANA

SOLD BY:

Apex Equipment Company
Boweird Supply Company
Industrial Supply Company
Murray Brooks, Inc.

CANADA: Rocky Mountain Supply Co.

EXPORT SALES: Direct and through legitimate export dealers.

BREWSTER MATCHED Drilling Equipment

MATCHED DRILLING EQUIPMENT

Model 6-S Swivel Oil Lubricated—220 tons.

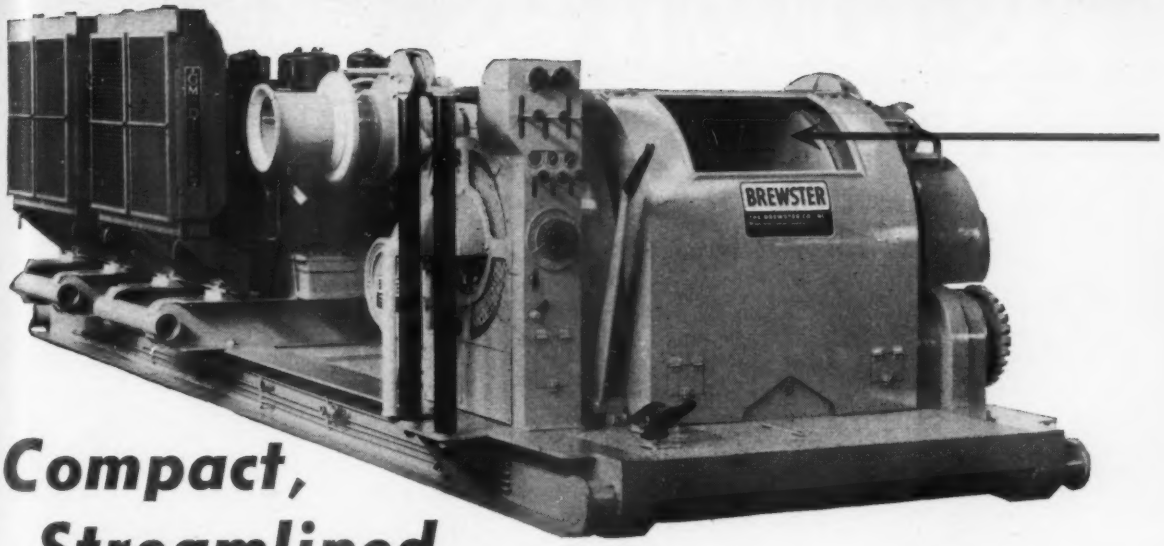
Model 200 Block, four 36" Sheaves, 200 ton capacity.

Model RS-22 Rotary, 22" Table Opening, 265 ton Dead-load capacity.

24 HOUR FIELD SERVICE — ANYWHERE

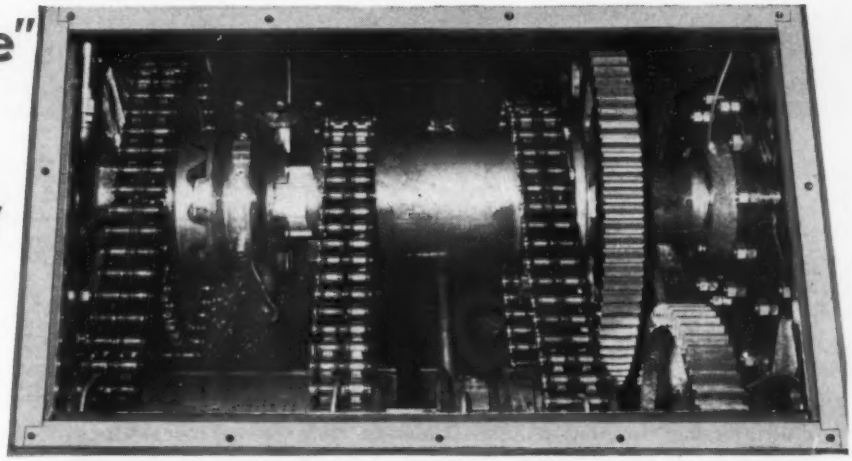
SINCE 1910—MANUFACTURERS OF FINE DRILLING EQUIPMENT

B R E W S T E R



Compact, Streamlined and LINK-BELT Roller Chained..

3 "Field-Wise" Features of the Brewster N-7 Drawworks



Brewster built this N-7 drawworks around features they knew operators wanted... a compact, streamlined rig with smooth operation and plenty of reserve power.

Then Brewster chained this drawworks completely with Link-Belt Precision Steel Roller Chain... favorite of manufacturers and operators alike.

Power in the N-7 is delivered through an oil bath compound and 4-speed 600 H.P. transmission giving 8 line speeds... all chained with Link-Belt Precision Steel Roller Chain.

Great strength, light weight, flexibility and ability to withstand sudden shocks has made Link-Belt top performer among roller chains. It's the result of more than 70 years of chain improvements.

LINK-BELT COMPANY

Indianapolis 6, Dallas 1, Houston 1, Los Angeles 33, Kansas City 8, Mo., New York 7, Toronto 8. 11.888

LINK-BELT *Precision Steel*
ROLLER CHAINS AND SPROCKETS

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it's NATIONAL SEAMLESS CASING

THAT rugged casing in the above picture has an interesting background. Right from the preparation of the mix, the steel for this casing has been treated with the utmost care and skill possible.

The reason for this is simple—only the most precise metallurgical control will assure steel that will meet National Tube standards. For our method of seamless manufacture—actually piercing a billet of steel—is one of the most drastic forging operations in the steel industry. Only the very best steels can withstand this test—the basic operation in the production of NATIONAL Seamless Drill Pipe, Casing and Tubing.

All the special care we take, to make sure the steel is right, is fully justified by results. The records of NATIONAL Seamless show performance unsurpassed by any other kind of pipe or tubing—superior performance characterized by higher collapse resistance and increased joint strength . . . quick, easy stabbing . . . smooth make-up . . . tight joints. And remember: NATIONAL Seamless has no welds, no seams, nothing to weaken or injure the tube.

Write today for information. Address National Tube Company, Frick Building, Pittsburgh 19, Pa. Ask for Bulletin 15, "Seamless Drill Pipe, Casing and Tubing."

NATIONAL TUBE COMPANY, PITTSBURGH, PA.

UNITED STATES STEEL EXPORT COMPANY, NEW YORK

TWO EXCLUSIVE FEATURES THAT MEAN BETTER NATIONAL SEAMLESS CASIN

DEOXIDIZED BESSEMER STEEL — has
superior forging qualities necess
for seamless pipe manufacture.
high yield strength and good ducti
mean greater toughness . . . gre
collapse resistance. Produced in A.P.
H-40 and J-55 grades.

WARM-WORKED CASING — superior
cold reduction, warm working impo
less stress on the metal . . . permit
to be stress-relieved as it cools.
sult: higher collapse resistance,
creased joint strength. Furnished
A.P.I. N-80 grade.

USS

NATIONAL SEAMLESS

drill pipe . . . casing . . . tubing

UNITED STATES STEEL

extra service for your equipment when "WEAR-RESISTED" with AIRCO hardfacing alloys

Because of the hardness and other desirable characteristics of these alloys, they provide high resistance to all types of wear—abrasion . . . impact . . . heat . . . corrosion. One application often adds 2 to 25 times longer service life to *worn or new* parts . . . big dividends in savings of "down-time" and replacements.

There is an Airco alloy available for oxyacetylene flame or electric arc application to meet all types of wear conditions.

1. ***Severe abrasion and medium impact***
2. ***Shattering impact and abrasion***
3. ***Severe impact and abrasion***
4. ***Sliding abrasion and impact***
5. ***Extreme earth abrasion***
6. ***Corrosion and heat***

Constant research is developing new alloys to meet special wear problems as they occur.

If you have parts or tools subject to any type of wear, it will pay you to investigate the savings you can make in maintenance and replacement costs by using Airco Hardfacing Alloys.

For further information about Airco's complete line of "wear-resistant" alloys, write your nearest Airco office or Authorized Dealer for a free copy of the Hardfacing Alloys Catalog.

More news about AIRCO products

FOR SEVERE IMPACT AND RESISTANCE TO ABRASION
Airco No. 388 Electrode

A shielded arc electrode sufficiently high in alloy content to produce a deposit bearing approximately 9% chrome and 0.9% carbon. This alloy content results in a weld metal deposit which is essentially martensitic.

Operators will find that the exceptionally fine arc action of Airco No. 388 increases both the speed and quality of their work.

FOR RESISTANCE TO EXTREME EARTH ABRASION
Airco Tungtube
Nos. 8, 10, 20, 30 and 40

These are fabricated rods of tungsten carbide particles encased in a steel sheath. The various Tungtube numbers indicate the screen size of the tungsten carbide particles contained within the tube. With its extreme hardness tungsten carbide ranks second only to the diamond in earth cutting efficiency. It is accepted as the standard means of cutting non-metallic substances; such as, coal, shale, and granite. It is recommended for core bits, fishtail bits, road plows, coal cutter knives, plow shares and similar equipment subjected to extreme earth abrasion.

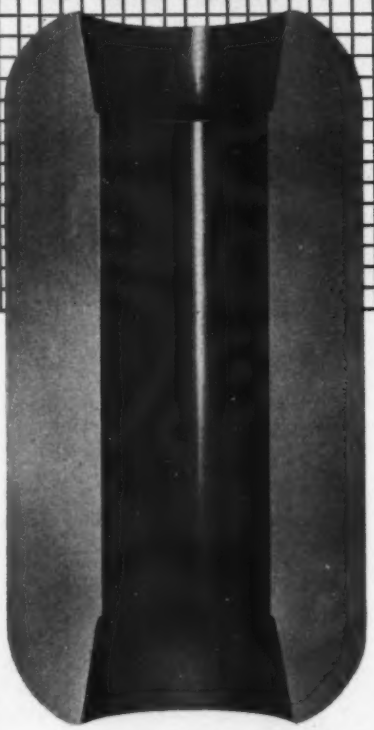
CORROSION – ACID RESISTANT ALLOYS FOR WELDING HARDER GRADES OF ALUMINUM BRONZE
Airco Nos. 100, 116, 120, 125 and 130 Electrodes

For joining aluminum bronze or other metals and combinations of dissimilar metals—and for overlays on bearing surfaces, machine parts, dies, etc. The deposits made with these electrodes are corrosion and acid-resistant and will also retard wear from abrasion and impact.

AIRCO **AIR REDUCTION**
Offices in Principal Cities

Cross Section of Quality

or why Patterson-Ballagh Casing Protectors last longer



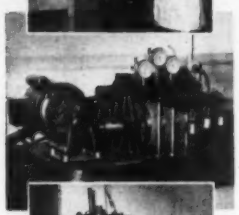
These tapered recesses allow less stretching at the ends, keeping stress here less than in thick body when Protector is installed, thus eliminating tearing at this vulnerable point.

Quality Protectors come from quality workmanship in the shop and laboratory. This new shock-proof, tear-resistant Casing Protector represents endless hours of testing in both laboratory and field. Now it is *field proven* and ready for your drill pipe.

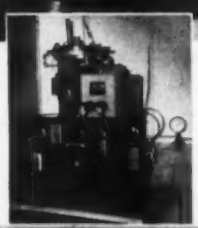
This new design meets the rough use and abuse of deep drilling. Engineers know that rubber under less stress will withstand more shock and tearing action than highly stressed rubber. Since the ends of a protector take the greatest beating down the hole, the tapered ends of the new Patterson-Ballagh Protector are not stressed as highly as the body, yet they grip the drill pipe firmly and prevent any fluid from getting between the rubber and drill pipe. These resilient ends allow the Protector to absorb shock and resist tearing action at this point.

To further insure proper rubber stress, *every Protector is designed for one, and only one, size drill pipe.* Call your Patterson-Ballagh man and have a new Protector installed on every length of drill pipe.

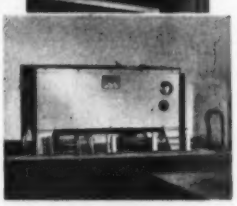
Tensile testing machine tests rubber samples from each batch of rubber to insure quality control.



This machine tests the abrasion-resistance of rubber samples—another example of why we know our Protectors will give long wear.



Rubber samples are aged, equivalent to two years, in a few hours time in high pressure oxygen ageing equipment.



The resistance of rubber under tension to hot oil is determined in this bath that simulates actual operating conditions.

PB

Patterson-Ballagh

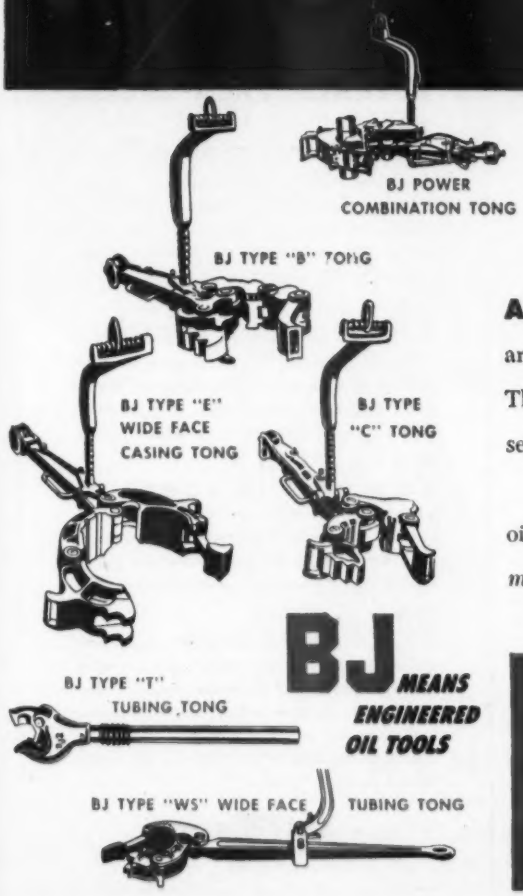
Division of Byron Jackson Co.

MAIN OFFICE: 1900 East 65th Street
Los Angeles 1, California

THERE ARE MORE BJ TONGS

WORKING ON THE WORLD'S DRILLING RIGS...

more than any other make!


BJ POWER COMBINATION TONG
BJ TYPE "B" TONG
BJ TYPE "E" WIDE FACE CASING TONG
BJ TYPE "C" TONG
BJ TYPE "T" TUBING TONG
BJ TYPE "WS" WIDE FACE TUBING TONG

BJ *MEANS ENGINEERED OIL TOOLS*

AND HERE'S WHY! *They're Tough*—Tough BJ Tongs are hard at it long after ordinary tongs are tossed in the sump. They're made for work. Trip after trip on well after well you've seen the same dependable sets of BJs go to work.

That's the kind of time and money saving performance oil men want in the tools they use. *And that's why more oil men specify and buy BJ!*

Byron Jackson Co.

Main Office & Plants Los Angeles 54, Calif.
Mid-Continent Office & Plant, Houston 1, Texas
Export Office: New York 17, New York
STOCKING JOBBERS AT PRINCIPAL OIL FIELDS

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Top performance for tough jobs!

Chevrolet P•L Truck performance consists of many things. There is Chevrolet design—brilliant and functional—design with a purpose. There is Chevrolet construction—sturdy and dependable—for lasting usefulness.

And there is Chevrolet power—power to deliver the goods—more power than Chevrolet trucks ever had before. Two great valve-in-head engines—the Load-Master 105 h.p. and the Thrift-Master 92 h.p.—make these the most powerful Chevrolet trucks ever built.

These new P•L models are far ahead in features, too; yet they cost surprisingly little to buy, to operate, to maintain. And that adds up to value—the kind of outstanding value that year after year makes Chevrolet America's fastest selling truck.

CHEVROLET MOTOR DIVISION, *General Motors Corporation*, DETROIT 2, MICH.

LEADING WITH ALL THESE PLUS FEATURES:

• TWO GREAT VALVE-IN-HEAD ENGINES: the New 105-h.p. Load-Master and the Improved 92-h.p. Thrift-Master—to give you greater power per gallon, lower cost per load • THE NEW POWER-JET CARBURETOR: smoother, quicker acceleration response • DIAPHRAGM SPRING CLUTCH for easy action engagement • SYNCHRO-MESH TRANSMISSIONS for fast, smooth shifting • HYPOID REAR AXLES—5 times more durable than spiral bevel type • DOUBLE-ARTICULATED BRAKES—for complete driver control • WIDE-BASE WHEELS for increased tire mileage • ADVANCE-DESIGN STYLING with the "Cab that Breathes" • BALL-TYPE STEERING for easier handling • UNIT-DESIGN BODIES—precision built.

CHEVROLET P*•L*

ADVANCE-DESIGN TRUCKS

P*opularity L*eaders

Chevrolet trucks outsell all others. In every postwar year truck users have bought more Chevrolets than any other make—*proof* of the owner satisfaction they have earned throughout the years.

P*erformance L*eaders

The new Chevrolet P•L trucks give you high pulling power over a wide range of usable road speeds—and on the straightaway, high acceleration to cut down total trip time.

P*ayload L*eaders The rugged construction and all-around economy of Chevrolet P•L trucks cut operating and repair costs—let you deliver the goods with real reductions in cost per ton per mile.

P*rice L*eaders From low selling price to high resale value, you're money ahead with Chevrolet trucks. Chevrolet's rock-bottom initial cost—outstandingly low cost of operation and upkeep—and high trade-in value, all add up to the lowest price for you.

CHEVROLET

replacements are less frequent far when you use

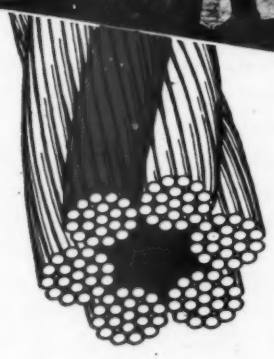
-Preformed-

"HERCULES"

REG. U.S. PAT. OFF.

RED-STRAND

WIRE ROPE



because –

Its strength... its toughness... its unusual endurance–add up to longer wire rope life

These essential life factors are not a matter of chance. They are the result of combining "HERCULES" quality and PREFORMING. This is a winning combination as Preforming is the process that increases the life of a wire rope, by freeing it of internal stresses. It also makes a wire rope easier, quicker and safer to handle.

"HERCULES" RED-STRAND the DEPENDABLE WIRE ROPE for any TOUGH JOB

MADE ONLY BY

A. LESCHEN & SONS ROPE CO.

ESTABLISHED 1857

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NEW YORK 6 CHICAGO 7 BIRMINGHAM 6 HOUSTON 3 DENVER 2
LOS ANGELES 21 SAN FRANCISCO 7 PORTLAND 9 SEATTLE 4

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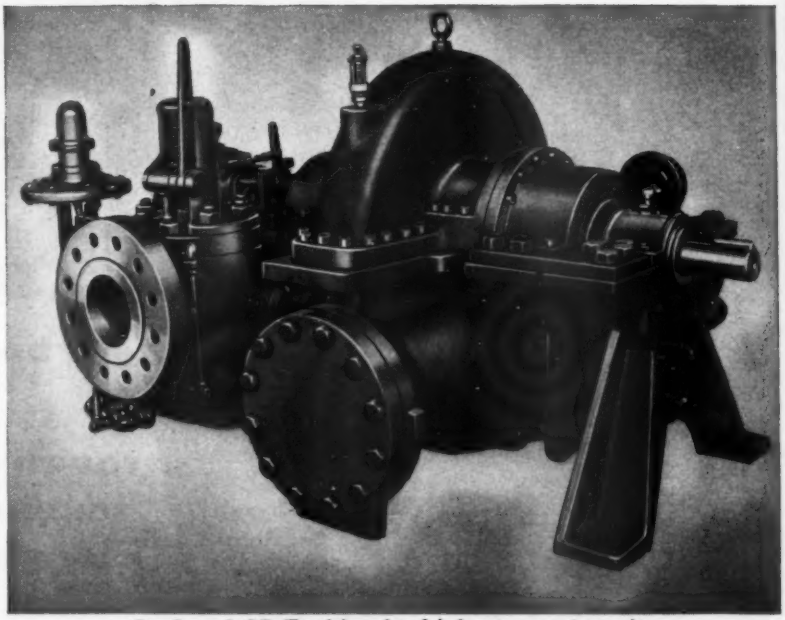
A NEW SINGLE-STAGE TURBINE DESIGNED ESPECIALLY FOR HIGH PRESSURES...

Initial pressures to 1450 psig .. Back pressures to 300 psig

THE FIRST SINGLE-STAGE TURBINE WITH ALL-LABYRINTH SHAFT SEALING

This new, high pressure single-stage turbine is more than an ordinary single-stage turbine in a "beefed up" high pressure casing. It is the *first* single-stage, mechanical drive turbine with all labyrinth shaft seals of the type generally used in large, multi-stage turbines especially designed for high pressure service.

Steam leakage along the shaft is effectively prevented by a labyrinth seal consisting of a series of shaft grooves and mating tongues of stainless steel—as many as 52 labyrinths per side being employed for the highest pressures. The labyrinth seal reduces losses, lasts longer and require less maintenance than carbon rings subject to wear.



De Laval CP Turbine for high pressure service.

When you buy a De Laval CP Turbine you also get...

True center-line support—to provide for thermal expansion without disturbing shaft alignment.

Choice of eight governing systems—to meet every control requirement.

Independent, positive over-speed trip entirely independent of the governing system for positive protection.

Horizontally split casing with steam chest in bottom half. The cover can be lifted without disturbing piping connections.

The De Laval CP Turbine is made in three sizes for capacities up to 2000 hp. For further information write for Bulletin 4215-33A-OG.

DE LAVAL

DE LAVAL STEAM TURBINE COMPANY, TRENTON 2, N. J.

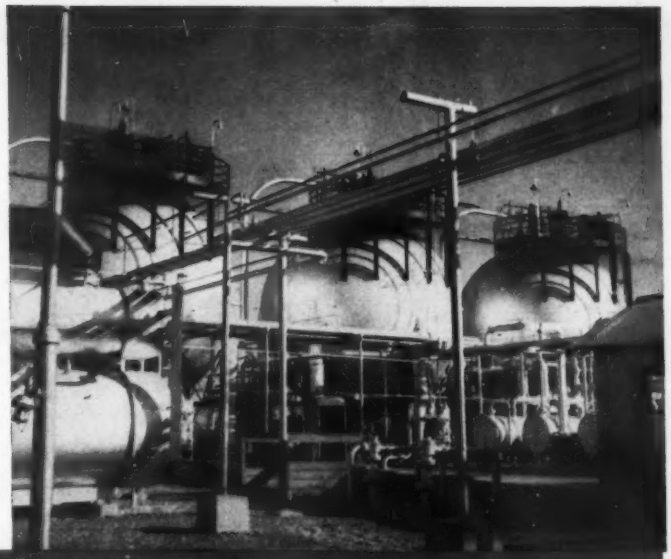
TURBINES • HELICAL GEARS • CENTRIFUGAL BLOWERS AND COMPRESSORS
CENTRIFUGAL PUMPS • WORM GEAR SPEED REDUCERS • IMO OIL PUMPS

T-33A

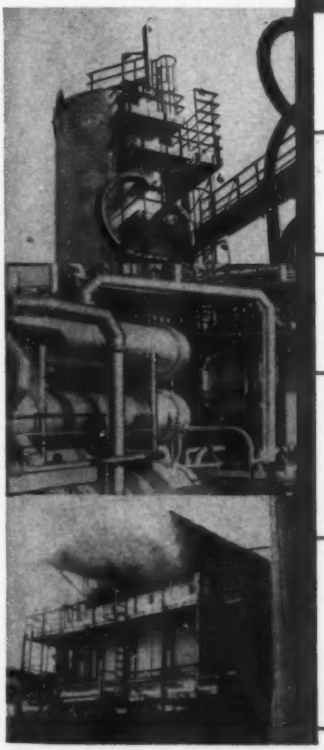
PETRECO DESALTING

assures maximum operating economy

Mechanical failures caused by salts and solids in the charging crudes are costly, *yet avoidable.* In one refinery after another, Petreco Desalting has demonstrated a rapid pay-out in terms of improved operations, increased on-stream time and lowered maintenance costs.



PETRECO DESALTING



assures these operating advantages	makes possible these profitable economies
Higher sustained cracking temperatures	*Deeper cracking, increased gasoline yield*
Less plugging in furnace tubes	*Fewer tube failures, higher charge rates*
Reduced corrosion in overhead equipment	*Savings in shut-down time, material replacements*
Less plugging in exchangers, improved flow	*Decreased clean-out costs, more efficient exchange, longer runs*

Petreco offers the most complete, extensive and experienced desalting service organization available in the petroleum industry.

The above listed benefits from Petreco Desalting are not the only benefits cited by users of the process. They are, however, the benefits cited universally as substantial profit items. For complete information on Petreco Desalting, write to or call any Petreco office.

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PETRECO

SPECIALIZED *Electric* PETROLEUM PROCESSES { DESALTING / DEHYDRATING

PR 50-5

Cummins® Custom-built Diesels

Built not once but Twice

The better-built engine for better power profits

Every lightweight high-speed Cummins Diesel is actually built *twice*. After initial assembly, each engine is run-in on the test block. Then it is torn down and carefully re-inspected — after that it is re-assembled and tested *again* to assure *peak performance*. And that is only *one* example of the extra care, the precision-workmanship . . . that goes into every Cummins custom-made engine.

That's why a Cummins Diesel is an investment that has *greater earning power* for you. The finest of engine-craftsmanship...exclusive Cummins fuel system...and custom-built engines "that fit your job" make a rugged, quality-engineered Cummins Diesel *the better buy for your power needs.*

Contact your Cummins dealer. He has more facts to show you about making more profits with

CUMMINS Diesel

TRADEMARK REG. U. S. PAT. OFF.

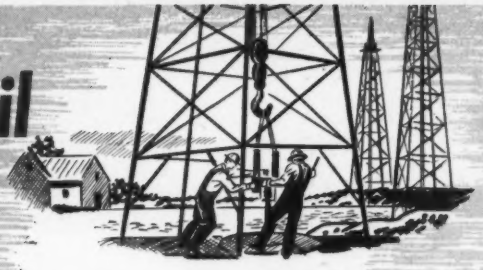
Diesel power by CUMMINS

CUMMINS ENGINE COMPANY, INC. • COLUMBUS, IND.

EXPORT: CUMMINS DIESEL EXPORT CORPORATION
Columbus, Indiana, U. S. A. • Cable: Cumdiex

Lightweight High-speed Diesel Engines (50-550 hp) for: On-highway trucks • off-highway trucks • buses • tractors • earth-movers • shovels • cranes • industrial locomotives • air compressors logging yarders and loaders • drilling rigs • centrifugal pumps generator sets and power units • work boats and pleasure craft.

Where there's oil you'll find...



LUNKENHEIMER VALVES

Lunkenheimer Gate Valves in a Texas Natural Gas plant.

• Preferred for dependability and their low cost upkeep, LUNKENHEIMER VALVES are used wherever oil is produced, processed or transported. Available in hundreds of types and patterns . . . globe, gate, angle and check valves for all pressure and temperature requirements . . . all of the highest quality.

LUNKENHEIMER Distributor Service, in every oil producing center, is another reason for the popularity of LUNKENHEIMER VALVES throughout the petroleum industry.

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"QUALITY"

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NEW YORK 13 • CHICAGO 6 • BOSTON 10 • PHILADELPHIA 34

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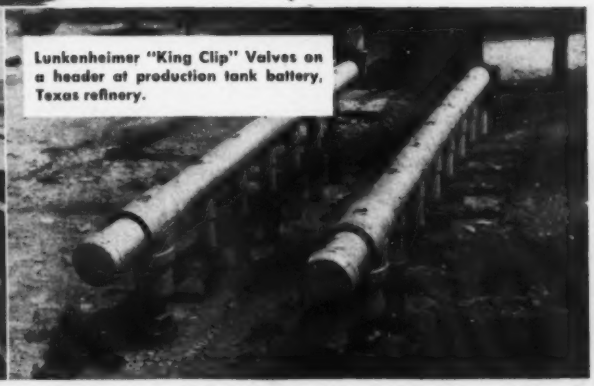
Leadership through Achievement

Easy-to-service "King Clip" Valves shown on production facilities of an Oklahoma producer.



Lunkenheimer "King Clip" Valves on a header at production tank battery, Texas refinery.

CUT YOUR PIPE COSTS 50%

Get corrosion resistance at lowest cost . . .

BUY ALCOA ALUMINUM PIPE

Only aluminum pipe offers you corrosion resistance at such low cost! Alcoa Aluminum 63S Pipe costs as little as half what other corrosion-resistant metals cost; less than twice the cost of ordinary rustable metal pipe.

Alcoa 63S Pipe is highly resistant to attack by sulfur and sulfurous gases—safely carries many chemicals, petroleum products, foods, other commodities. The products don't hurt the pipe; the pipe won't hurt the product.

You save money on installation, too. This pipe weighs only one-third as much as heavy metal pipe. Requires less labor. Can be joined easily, using familiar standard fittings available from nationally known manufacturers.

Alcoa Aluminum Pipe comes in $\frac{1}{8}$" to 12" standard pipe sizes. For your nearest supplier, phone your local Alcoa sales office (branches in 55 cities). Or write ALUMINUM COMPANY OF AMERICA, 1978F Gulf Bldg., Pittsburgh 19, Pennsylvania.

FREE BOOKLET

gives you the facts on Alcoa Aluminum Pipe —physical and mechanical properties, lists products for which it is recommended. Write today.

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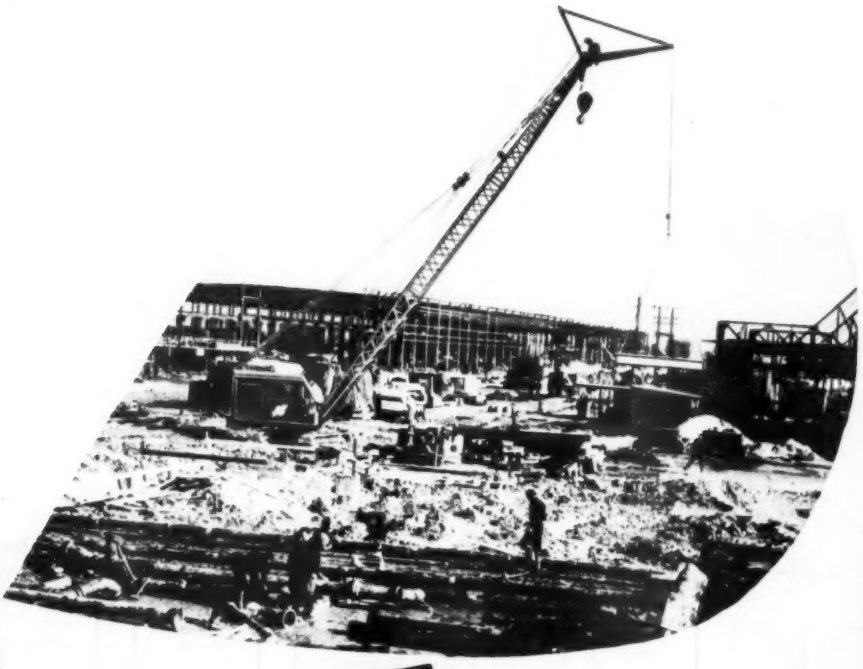
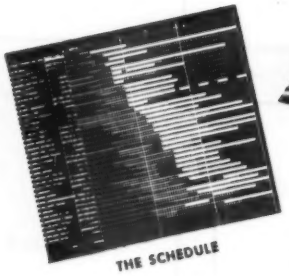
now building **4** complete petroleum refineries.

ENGLAND . . CANADA . . SPAIN . . BOLIVIA

the plot-plan comes alive





THE SCHEDULE

the schedule—the plot-plan—the thousands of details involved in both...labor...materials...transportation...and, of course, the weather...but when all are coordinated by experienced planners and constructors—then, gradually and "on time,"—the big refinery takes shape.

This New Esso Refinery of the Anglo-American Oil Company at Fawley, England, now being built by Foster Wheeler, is scheduled for operation early in 1952. It will be the largest refinery in Europe, with a crude charge capacity of 110,000 bbl day.

FW

FOSTER WHEELER CORPORATION

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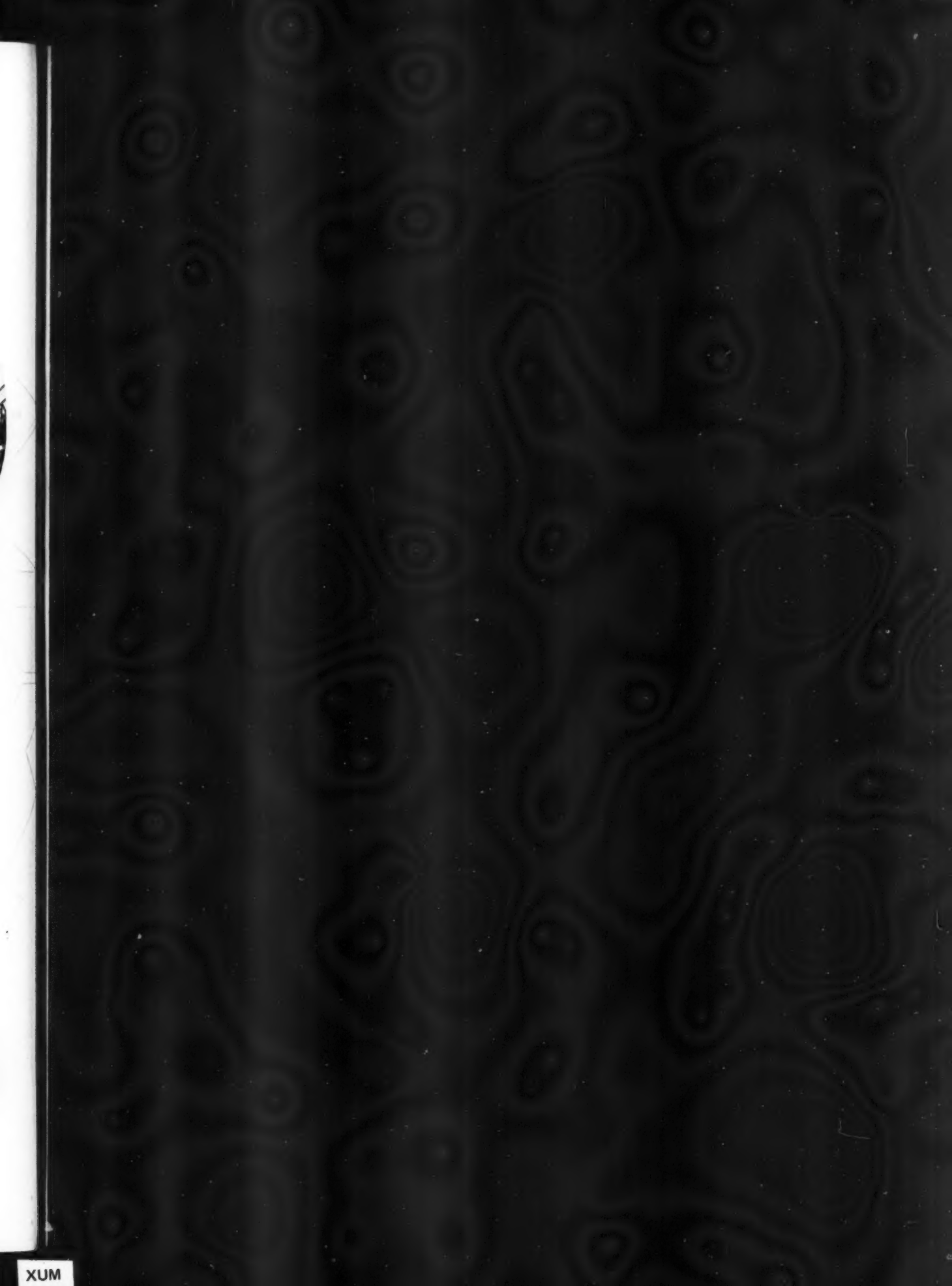

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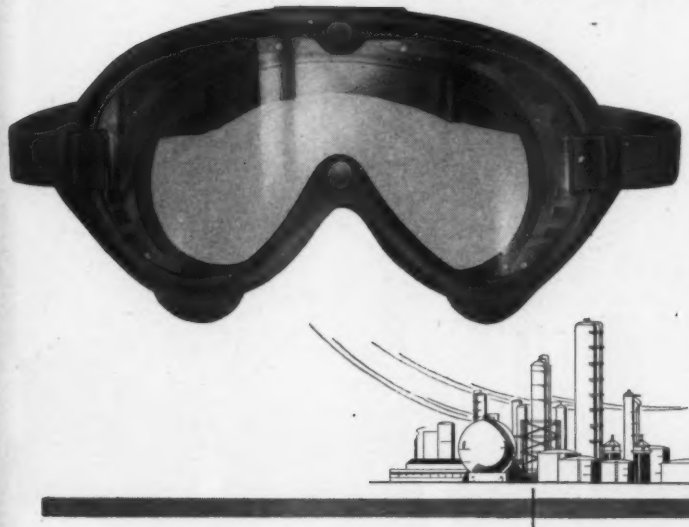
AO Rubber Frame Goggles

Favorites because they're

LIGHT and COMFORTABLE



AO 700 RUBBER-FRAME GOGGLE

Here's the chemical worker's favorite for "4-in-1" eye protection against splashes, spray, foreign particles and fine dust concentrations. Goggle features a genuine rubber frame which is non-irritating and acid resistant; positive safety is assured by an airtight fit and all face-contacting surfaces are broad for maximum comfort. Large, shatter-resistant, easily replaceable acetate lens gives wide vision and resists fogging because perforations at frame top and sides permit ample air entry. Easily adjustable rubber headband.

AO 705 SUPER-VENT GOGGLE

WHERE IT'S HOT AND HUMID the super-vent nose piece of this goggle is a friend indeed! Its inhalation and exhalation valves prevent fogging and steaming.* Acid or dust can't seep through the airtight frame molded from acid-resistant, non-irritating rubber. Further ventilation and anti-fogging are provided by perforations at top and sides. Ventilation is indirect, dust cannot reach eyes. Headband and lens are similar to those of the "700" goggle.

*On inhaling, air removes moisture on inner lens surface before it can fog. Exhaling, inlet valve closes, allowing moist air to escape through exhalation valve.

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Boss—LCP* is the Best Employee on Our Payroll!

MORE and MORE WELLS ARE PUMPED BY *LCP EVERY DAY!

That's me he's talkin' about—*LCP! With me on the job, major oil companies report continuous, trouble-free operation. Payroll and maintenance costs are reduced, too! My automatic control makes the job easier for everyone! They call me ECONOMY IN ACTION! The Power Engineer of your Utility Electric Power Company can tell you—I'm the Best Employee on many a payroll!

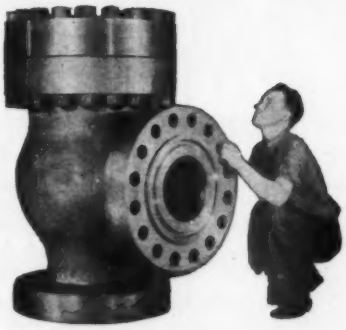
*LOW COST POWER

PETROLEUM ELECTRIC POWER ASSOCIATION

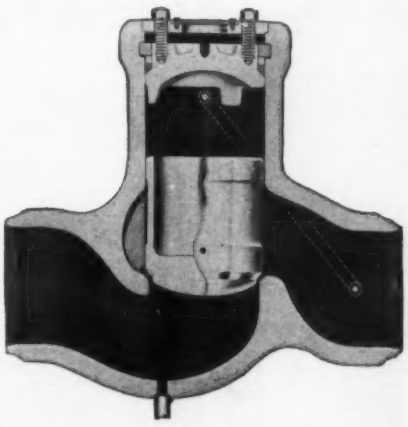
PIPING FLEXIBILITY *with* Edward *Check Valves*

FOR large, medium or small lines . . . for horizontal, vertical or angle installations . . . for 150 lb to 7500 lb service . . . stainless steel or Stellite trim . . . whether you need flanged, screwed or welding ends—there is an Edward steel check valve to meet your requirements. Many sizes and types are in stock for immediate shipment.

BIG CHECKS

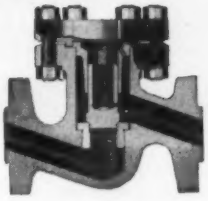


Vibration, clatter and damaging shock to piping are eliminated with Edward piston-type check valves. Integral guide ribs, cored out for free flow, guide the hourglass disk-piston throughout travel to prevent hanging up. New flow contours reduce pressure loss, increase operating efficiency. Built in sizes through 14 in.



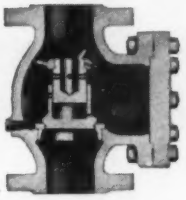
AVAILABLE IN HORIZONTAL ~ . . . ANGLE ⌐ . . . VERTICAL |

MEDIUM



Exclusive Edward disk guide lip aids tight seating and cuts wear on seat and disk through momentary throttling action.

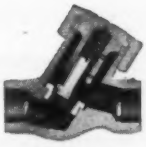
Edward check valves may be disassembled without removing from the line. Covers are forged steel.



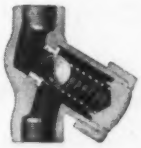
AVAILABLE IN HORIZONTAL ~ . . . ANGLE ⌐ . . . VERTICAL |

SMALL

Edward forged steel check valves are spring loaded to insure quick, accurate seating. Bodies are streamlined.



For viscous fluids or hydraulic service, Edward ball checks are ideal. Stainless steel ball is mated to seat.



Design of small Edward checks permits use in either horizontal or vertical lines. Built in sizes down to ¼ in.

AVAILABLE IN HORIZONTAL ~ . . . ANGLE ⌐ . . . VERTICAL |

Another Rockwell Product

Edward Valves, Inc.

Subsidiary of ROCKWELL MANUFACTURING COMPANY

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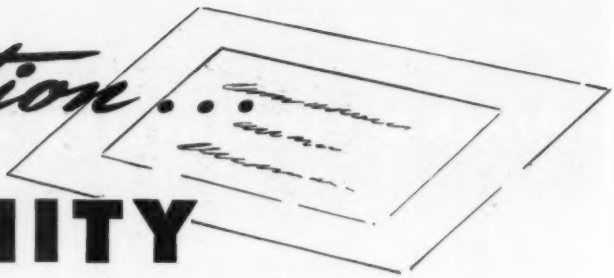
A REQUEST ON YOUR COMPANY LETTERHEAD WILL BRING EDWARD CATALOG No. 103

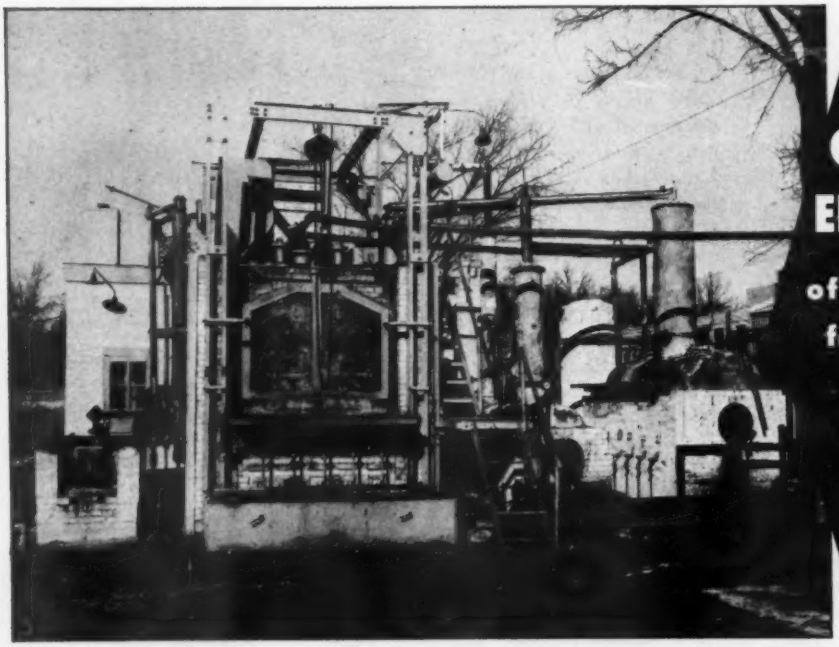
An Invitation . . .

and an . . .

OPPORTUNITY



To every organization interested in disposing of its heavy residues in the broad, highly profitable Metallurgical Coke market.



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offers the improved facilities of its Liquid Hydro-Carbon Coking plant (pilot) for commercial scale tests of your material.

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A test of your material may well prove to be the key to greater profits for you. The assistance of Curran Coking Specialists is at your disposal in solving your coking problem (at actual cost of test to us).

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(Minimum 3 bbls. requested for preliminary analysis). Larger sample required for full scale, commercial demonstration. Your representatives welcome during the course of the test. Wire, write or phone.

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HOW BIG

SHOULD AN OIL COMPANY BE ?

•

HERE IS A STRAIGHT ANSWER FROM ONE OF THE OLDEST COMPANIES IN THE INDUSTRY:

Socony-Vacuum is the size that it is — neither the biggest nor the smallest in the Petroleum Industry — because it is an efficient size for the kind of business we do.

Efficiency **is the key to a company's size — for it is the key to what the American public wants, the most for its petroleum dollar.**

Under the American system of business, a company that operates *inefficiently* soon *loses business* to other companies able to offer the public more value at lower cost. That's how American competition works — and if any company gets so big that efficiencies inherent in mass operation are more than offset by increasing costs — *competition* will cut that company to a proper size.

To put it another way:

A *company* is as strong as its competitive efficiency —

In turn, an *industry* is as strong as its companies —

And in turn, a *nation* is as strong as its industries.

Thus, *every* company, big or little, must be *"big" enough* to serve the best interests of the people in the area it covers!

***Since 1866*— the Flying Red Horse Companies have practiced *Competitive Efficiency* to supply you with Finest Petroleum products at the lowest possible cost!**

The Flying Red Horse Companies

SOCONY-VACUUM OIL COMPANY, INC.

and Affiliates: MAGNOLIA PETROLEUM CO. • GENERAL PETROLEUM CORP.

BENNY ROBINSON, Party Chief on Crew No. 5, started digging shot holes for Independent right after he got out of Louisiana Tech 15 years ago. He has progressed through practically every job on a geophysical crew, having worked as shooter, recorder, surveyor, and computer, before being made a party chief. Such long and thorough experience is typical of the seasoned men who head all Independent Exploration crews, where the average experience of party chiefs is 15 years in seismograph field work.

It's a Deep Secret!

The location of oil reserves far below the earth's surface is one of nature's carefully guarded secrets. For 17 years a long list of important oil producers have depended on the experienced crews of Independent Exploration Co. for scientifically accurate recording and interpretation of this essential subsurface data.

POINTING THE WAY IXC FOR THE DRILL

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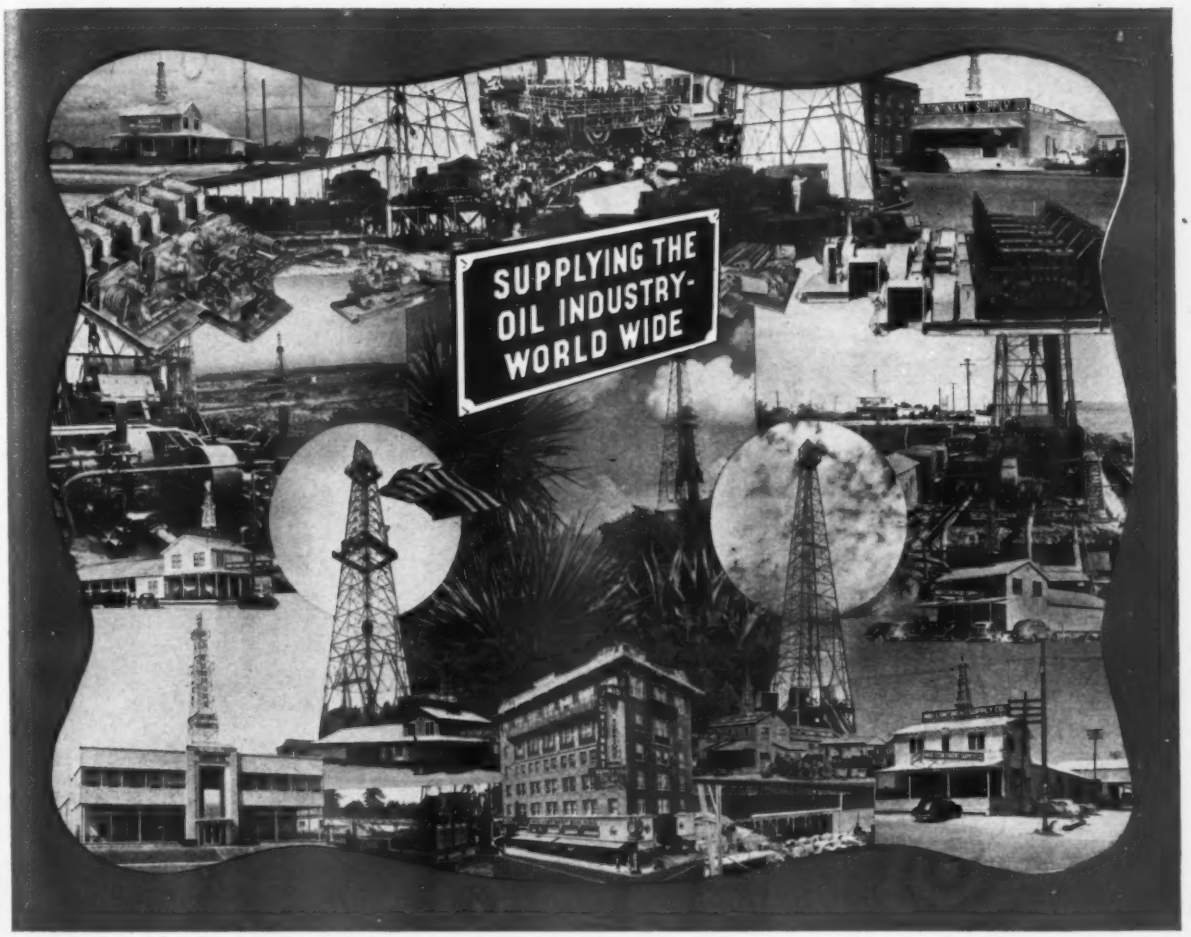

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Around the WORLD
SERVICE!!!

Whether it is at home or abroad . . . Wyoming . . . Brazil . . . Texas . . . or Venezeula, you will find Mid-Continent Supply Company conveniently ready to provide you the finest in equipment and the best of service by men with the "know-how" to save you time and money.

Mid-Continent stores are fully stocked and operate "Around-the-Clock" to eliminate expensive delays. When you need equipment . . . or the solution to any equipment problem . . . stop at your nearest Mid-Continent store, under the *famous* oil-spouting blue neon derrick!

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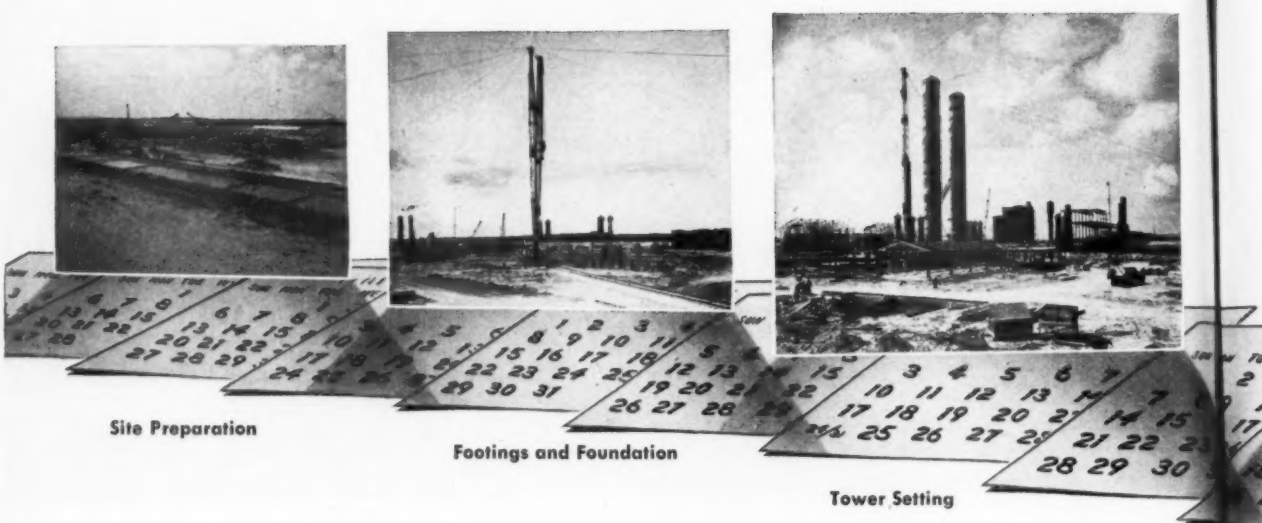
THE WORLD'S LARGEST INDEPENDENT OIL WELL SUPPLY COMPANY

XUM

your project "Scheduled by



Site Preparation

Footings and Foundation

Tower Setting

Scheduled by Lummus means engineering and construction is a complete integration of planning, forecasting and cost control, applied with individual responsibility from start to finish. Lummus' complete scheduling of your refinery project smooths the work flow. There is no wasted effort. You can count on delivery of an economical, well functioning plant on or before the required completion date.

Scheduled by Lummus means plant engineering starts earlier than conventional work planning. It begins with original process design and job engineering. Because time is money, the project is engineered from the start with emphasis on time-economies in the entire erection operation. Erection methods are analyzed in advance from the standpoint of practical application at the site.

THE LUMMUS COMPANY
385 Madison Avenue, New York 17, N. Y.

LUMMUS

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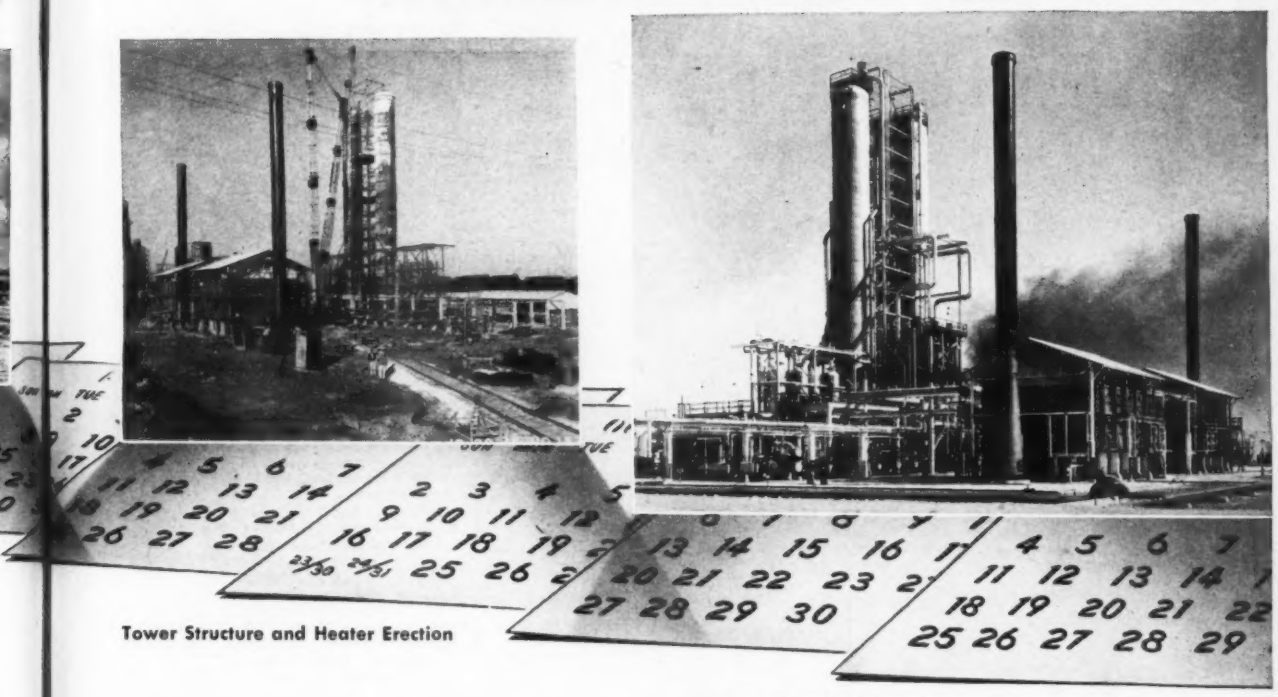
"Lummus" means READY ON TIME



Tower Structure and Heater Erection

Start-up and Operation

Scheduled by Lummus means all materials are planned to arrive as needed. Just the construction tools and skills required for the immediate use of these materials are provided at each successive stage of the job. Costs are kept under day-to-day scrutiny and control. Problems of delivering, erecting and coordinating individual units into an operating whole are anticipated, with hundreds of previous records as a guide.

Lummus' wide range of experience is the key to this thorough and advanced method of procedure. One recent job went from letting of contracts to successful operation in eight months. Another complete foreign refinery was completed in fifteen months. Your next project, "scheduled by Lummus" can be the answer to realistic cost control and the economies that come with completion on or ahead of schedule.

PETROLEUM HORIZONS, the new 80-page book on Lummus processes and plants, features a step-by-step description and flow sheets for 31 refinery processes. It brings you complete details on the background, organization and world-wide services of the Lummus Company. Your copy available on request.

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COLUMBIAN STEEL TANK COMPANY — TANKS FOR THE WORLD — KANSAS CITY, MO., U.S.A.

COLUMBIAN STEEL TANK CO. K.C. MO. — COP-NIC COPPER-NICKEL ALLOY — TANKS FOR THE WORLD

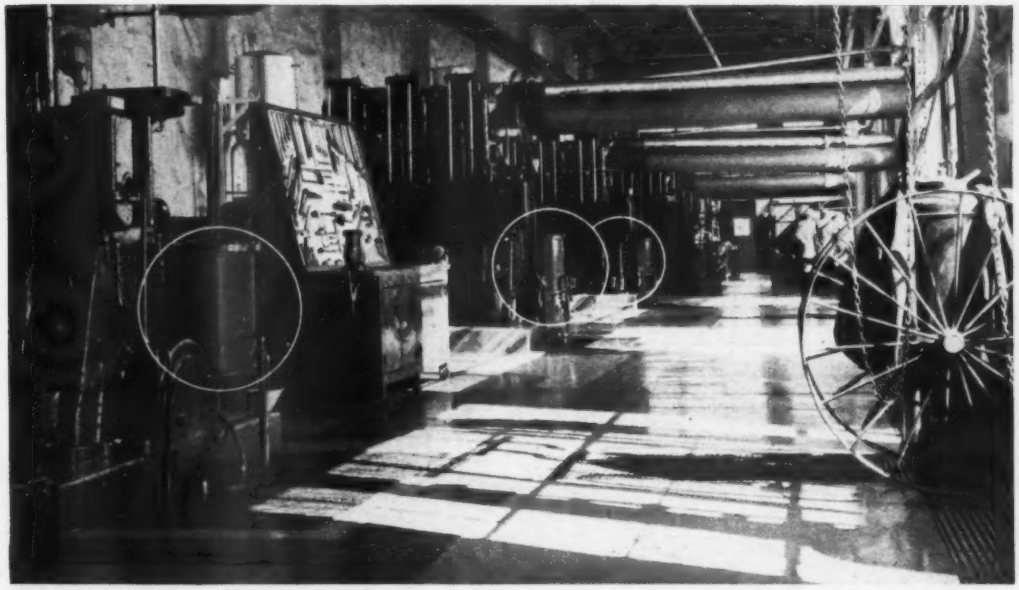
Columbian Bolted Steel Tanks have long been famous the world over for precision engineered design—quality construction—easy assembly—economical storage—extra measure of protection—long life service that pays extra dividends for every dollar invested.

Columbian Bolted Steel Tanks are available from the conveniently located distributors listed above—or write us. (Columbian COP-NIC Tanks, especially for sour crude, will be available when conditions permit.)

★ **COLUMBIAN ALL-METAL BUILDINGS** are first choice with more and more oil producers for use as warehouses, engine houses, garages, equipment and storage houses. Rigid, strong, fire-safe. Require minimum upkeep cost. Write for complete information.

COLUMBIAN STEEL TANK CO., P. O. BOX 4226-H, KANSAS CITY, MISSOURI

PIPE LINE PUMPING STATIONS CONVERT WINSLOW-FILTERED CRUDE OIL TO FUEL



While other Winslow Filters convert crude oil to fuel for the six De La Vergne Diesels in this Texas pumping station, five of the engines are also protected by Winslow Lubricating Oil Conditioners. (Note the three circled.)

One of the most remarkable filtration performances in the petroleum industry's history has become an around-the-clock, day-after-day routine operation in the pumping stations that keep crude oil flowing through the Texas pipe lines of one of the major producing companies. Pumping as much as 100,000 gallons of crude daily, the giant Diesels in these remote stations had problems of cost and supply in obtaining refined fuel. Crude was used in its place, but it was a poor substitute until Winslow Filters were applied. Now, at low cost and with freedom from shut-downs, the filtered crude oil is a dependable fuel.

WINSLOW FILTERS ARE BUILT TO SERVE THE OIL INDUSTRY IN MANY WAYS.

WRITE FOR DETAILS.

WINSLOW FILTERS

503-P-1

Winslow Engineering Company **4069 Hollis Street • Oakland 8, California**

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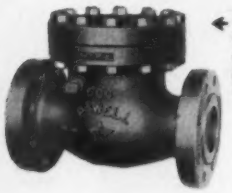
Do it the EASY way — *Standardize on* POWELL VALVES

When you get your valves from various sources, buying for replacement—and stocking spare valves and parts—becomes unnecessarily complicated.

But when you buy ALL your valves—Bronze, Iron, or Steel, and, if you need them, Corrosion-Resisting Valves—from ONE source, you have the answer to your flow control problems. Powell makes them all* and makes them better. Also Powell makes the *only* COMPLETE Line of Valves for Corrosion-Resistance available to Industry today.



← **Fig. 6061**—Class 600-pound Cast Steel Swing Check Valve with flanged ends and bolted cap. Disc has ample lift to permit full, straightway, unobstructed flow through valve body.

← **Fig. 1375**—200-pound Bronze Gate Valve with screwed ends, inside screw rising stem, union bonnet and renewable, wear-resisting "Powellium" nickel-bronze seat rings and disc.

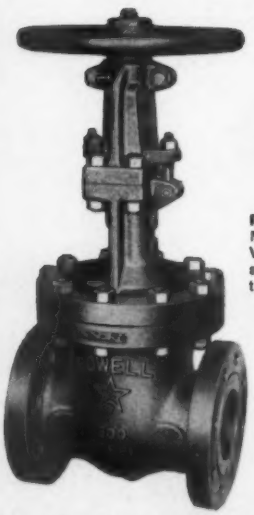


Fig. 3003—Class 300-pound Cast Steel Gate Valve with flanged ends, outside screw rising stem, bolted flanged yoke and tapered solid wedge.

Fig. 1460 — Iron Body Bronze Mounted "Master Pilot" Gate Valve with screwed ends, rising stem, bolted flanged bonnet and tapered solid wedge. →

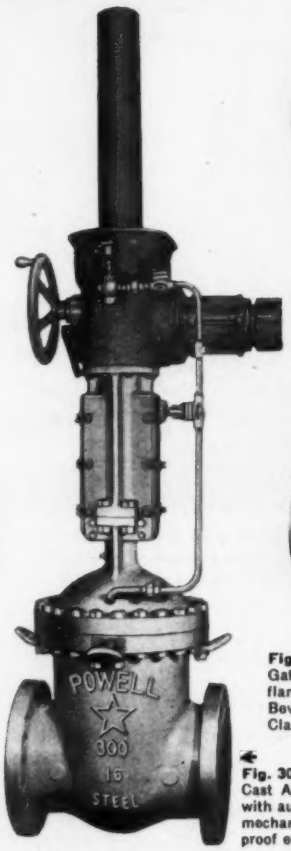


Fig. 6079 — Class 600-pound Cast Steel Gate Valve for Pipe Line Service. Has flanged ends and bolted flanged bonnet. Bevel gear operated. Also available in Classes 150, 300, and 400 pounds.

← **Fig. 3023**—Class 300-pound Cast Alloy Steel Gate Valve with automatic steam sealing mechanism. Has explosion proof electric motor operator.

*The Complete Powell Line includes Globe, Angle, "Y", Gate, Check, Non-return, Relief and Flush Bottom Tank Valves in Bronze, Iron, Steel and a wide range of Corrosion-resistant metals and alloys.

Ask your nearest Distributor—or write direct

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pump
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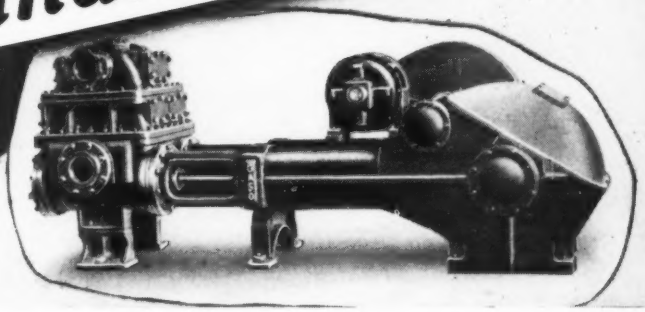
Time-tested design has been applied, in Gaso Pumps, to a complete line of sizes and models carefully planned to meet every operating condition. 100 models and sizes all made to protect and enhance a worldwide reputation for complete dependability, outstanding economy and unmatched durability. Write for catalog.

1900 SERIES

A 10" x 18" duplex piston type pump used for suction service and for low-pressure, large-volume transfer service.

for every oil industry need



GASO PUMP & BURNER MFG. CO.

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An HONORARY DEGREE Conferred on

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WELDING ELBOWS

By Pipe Welders Everywhere

Pipe welders who know Midwest Welding Elbows have conferred upon them an honorary degree unique in piping . . . "D. A." for "dimensional accuracy".

This degree was earned for Midwest Elbows by their unique process of manufacture. In this process, developed by Midwest, the elbow is first made slightly oversize. After welding it is reheated to forging temperature and brought to final size in compression dies. This relieves forming and welding stress . . . assures true circular cross-section, controlled wall thickness and accurate radius, included arc and tangents. The elbows are beveled on special machines which cut both ends simultaneously, holding exact included angle and center-to-end dimensions.

"D. A." is a degree which means a lot to pipe welders. It means that they don't have to waste time lining up inaccurate fittings. It means that they don't have to spend time and weld metal in compensating for bad fit. And it means that they can produce better, cleaner, stronger welds with less trouble.

"D. A." saves money for you when it saves time and trouble for welders. Use Midwest "D. A." Elbows on your next job. Call your Midwest Distributor; there is one conveniently near you.

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* Dimensional Accuracy

MIDWEST WELDING FITTINGS IMPROVE DESIGN AND REDUCE COSTS

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BUILDS FINE SPECIALIZED MARINE EQUIPMENT FOR THE PETROLEUM INDUSTRY

Whether it is a crew boat, an LST converted for off-shore drilling, or a submersible drill barge complete with drilling rig to customer's specifications (turn key), Levingston is prepared to *deliver the goods* with minimum delay . . . at reasonable prices.

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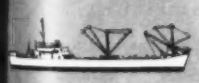
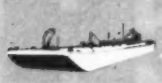


Non-self propelled oil well drilling tenders—converted LST's



Water, oil and supply barges

Tugs

Drydock for fast haul-out and repair of marine drilling equipment

Crew boats

Submersible drill barges

Drilling barges converted from navy seagoing barges

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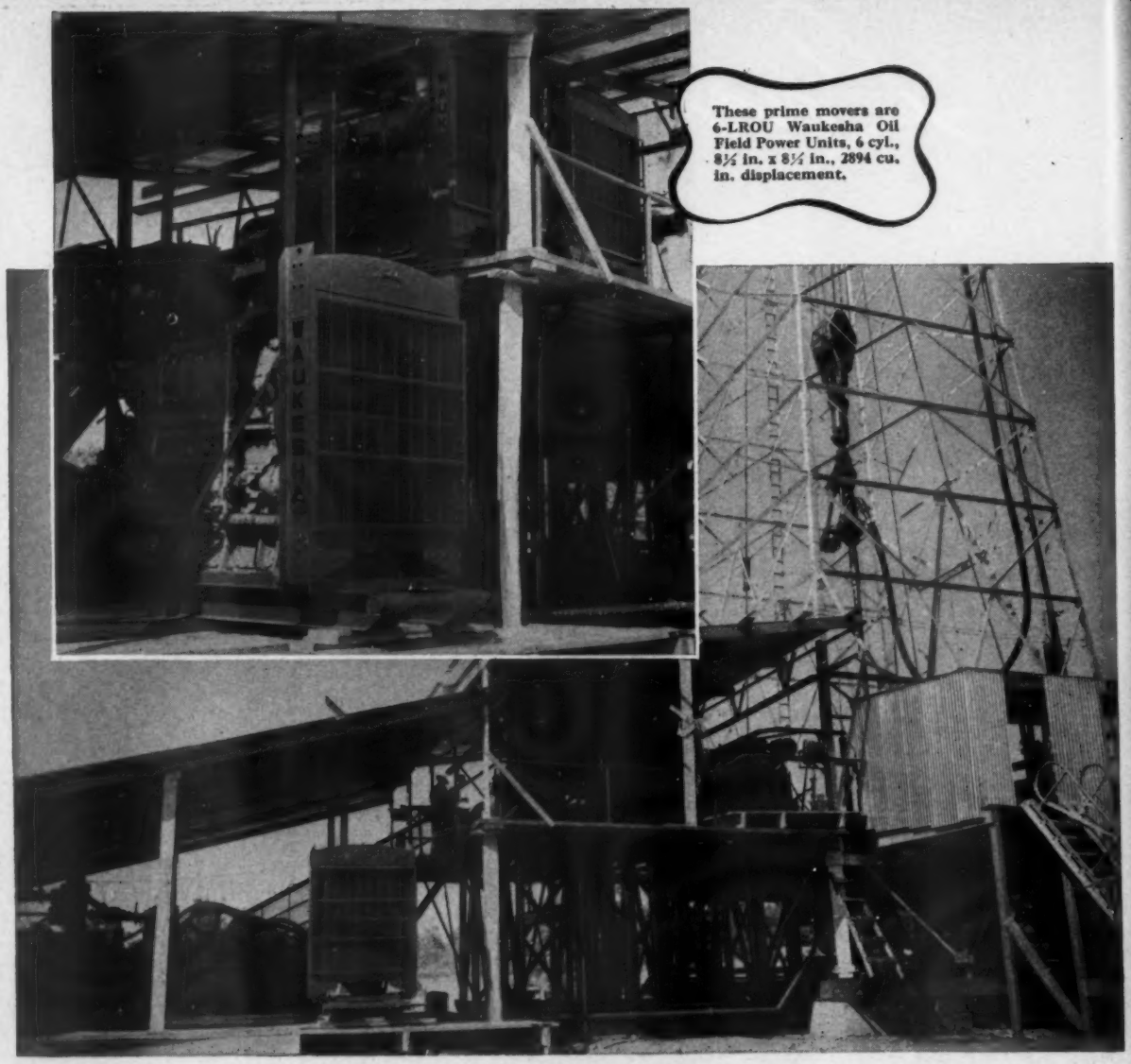


These prime movers are 6-LROU Waukesha Oil Field Power Units, 6 cyl., 8¼ in. x 8½ in., 2894 cu. in. displacement.

DEEP-DRILLING POWER...fast, flexible, smooth

The drillers are the Nichols-Duncan Drilling Co. The location is Velma Pool, Stephens County, Oklahoma. And the prime movers are three Model 6-LROU Waukesha Oil Field Power Units—six cylinders, 8¼ in. x 8½ in., 2894 cu. in. displacement, burning natural gas. These Waukeshas are *big enough* for the rig. Big enough in reserve power. It's no effort for *them* to meet *any* peak demand. Smooth enough too, and quickly responsive. As modern deep drilling power units have to be. Biggest of all in dependability! And equally low in fuel and lubricant costs. Bulletin 840 tells you why. Send for it.

with low overall cost!

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS., NEW YORK • TULSA • LOS ANGELES

WAUKESHA

"THE BEST

BIG METERS

WE'VE EVER USED"

A Distribution man writes: "It is very interesting to note the remarkable accuracy of your No. 4½ and No. 5 meters after passing large volumes of gas. For example, two of these meters measured 180 million cubic feet each at 10 psi pressure under severe turn-on and turn-off conditions. Upon test one of these meters was found to be ½ per cent slow and the other ½ per cent fast . . . Our repair costs for the Emco pressed steel meters in our system are considered exceedingly small in comparison to the large quantity of gas measured. They are the best big meters we have ever used."

Yes, performance-wise and dollar-wise Rockwell-Emco pressed steel meters are your best big meter buy. Ask for Bulletin No. 1033.

ROCKWELL-EMCO
Pressed Steel Meters

These Rockwell-Emco Gauges contribute to meter accuracy

THE EMCORECTOR

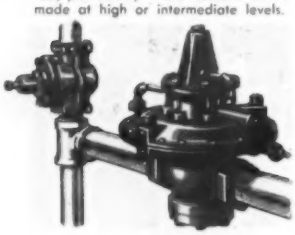
A recording gauge that gives a direct reading of metered volume corrected to contract base pressure irrespective of line pressure fluctuations. It eliminates all calculations.

COMBINED RECORD GAUGE

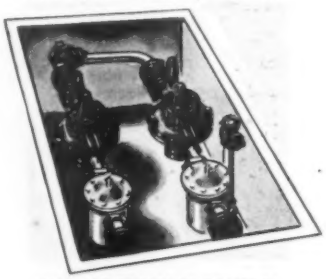
Provides chart pressure records from which can be calculated the metered volume corrected to any contract base pressure. Made in both meter and clock driven types.

XUM

LARGE METER SETTING
By maintaining constant inlet pressure "1001" regulators improve meter accuracy particularly where measurement is made at high or intermediate levels.



INDUSTRIAL BURNERS
High pressure burners and those requiring accurate temperature regulation (as in processing) benefit from the outlet pressure stability of "1001."



DISTRICT PRESSURE CONTROL
These regulators are frequently specified as district controls for systems operating at intermediate pressures or combined with low pressures.

1000 AND 1 APPLICATIONS FOR ROCKWELL-EMCO "1001" REGULATORS

Distribution engineers are continually finding new applications for Rockwell-Emco "1001" regulators. That's because they are general purpose controls—economicial to buy and maintain, sensitive in response and exceedingly accurate in their pressure control abilities. Now is the time to learn all about these compact, pilot loaded regulators that frequently do a better job of control than larger, more expensive specialized types. *Write for bulletin 1159.*

Pittsburgh Equitable Meter Division

ROCKWELL MANUFACTURING COMPANY
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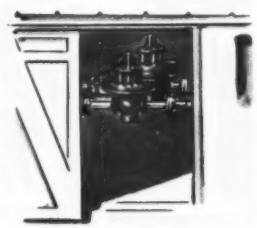
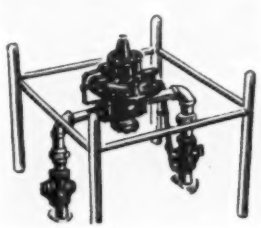
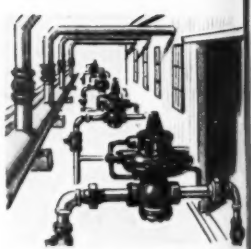


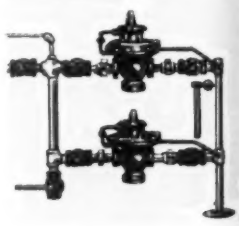
TOWN BORDER STATION
For small town border stations—those applications up to the capacity of 2-in. pipe—the "1001" regulator has no equal for adaptability and economy.



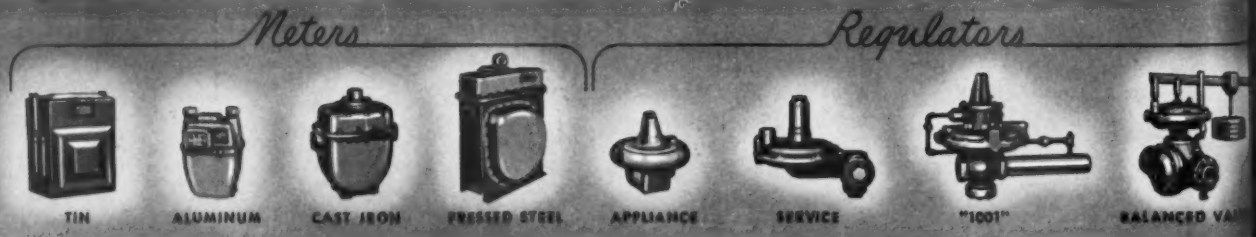
SMALL DISTRIBUTION SYSTEM
Distribution men, with years of "1001" regulator experience, find these controls are simple, rugged and adaptable to a wide range of operating conditions.



COMPRESSOR STATION
The "1001" regulator is highly popular for gas engine service due to its ability to maintain a constant pressure on the carburetor or mixing valve.

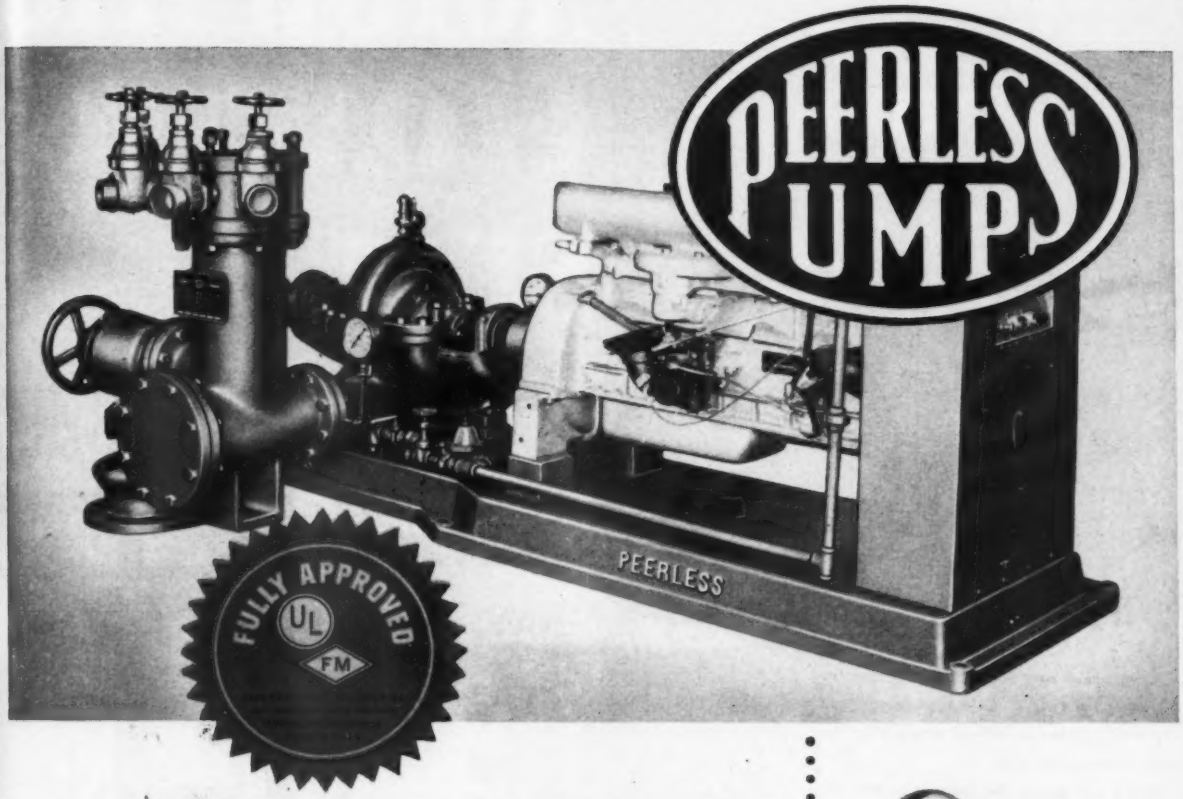


VAPORIZER UNIT
Compact design and extreme sensitivity of "1001" regulators are particularly appreciated in operation of vaporizers, large appliances, heat treat furnaces.



There's a **ROCKWELL - EMCO METER & REGULATOR** for every use

UNSURPASSED FIRE PROTECTION FOR COMMERCIAL AND INDUSTRIAL RISKS



UNDERWRITERS' APPROVED PEERLESS FIRE PUMPS

HORIZONTAL CENTRIFUGAL AND VERTICAL TURBINE TYPES—Peerless Underwriters' Approved Fire Pumps can be applied to practically every commercial and industrial risk requiring fire protection. They afford dependable, low cost protection, peak quality performance and unquestioned reliability that often will result in measurable savings in insurance cost.

SINGLE AND MULTI-STAGE—Peerless Underwriters' Approved Fire Pumps are available in two types. The Type AF, shown above, is a single stage, double suction, horizontal centrifugal design, with a capacity range of from 500 to 2000 g.p.m., affording pressures, at rated capacities, from 40 to 150 lbs. and is available in 4", 5", 6" and 8" discharge sizes.

The Type TUF is a 2-stage pump available in 4", 5", 6" or 8" discharge sizes and furnishes from 500 to 1500 g.p.m., with a pressure range, at rated capacities, from 100 to 200 lbs.

ALL TYPES OF APPROVED DRIVES—Peerless approved fire pumps may be equipped with any type of drive: electric, steam turbine, gasoline or diesel engine. Auxiliary stand-by engine drives may be used in conjunction with turbine or motor drive to assure instant service even in the event of power failure.

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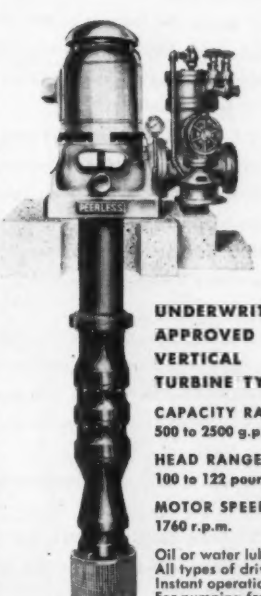
NEW 24-PAGE BULLETIN ANSWERS ALL QUESTIONS ON UNDERWRITERS' FIRE PUMPS—Peerless Bulletin No. B-1500 completely describes and illustrates these unsurpassed and approved fire protection pumps. Write for your free copy today.



UNDERWRITERS' APPROVED VERTICAL TURBINE TYPES

CAPACITY RANGE: 500 to 2500 g.p.m.

HEAD RANGE: 100 to 122 pounds.

MOTOR SPEEDS: 1760 r.p.m.

Oil or water lubricated. All types of drives. Instant operation. For pumping from any water source. Request Bulletin No. B-152-1.

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FOOD MACHINERY AND CHEMICAL CORPORATION
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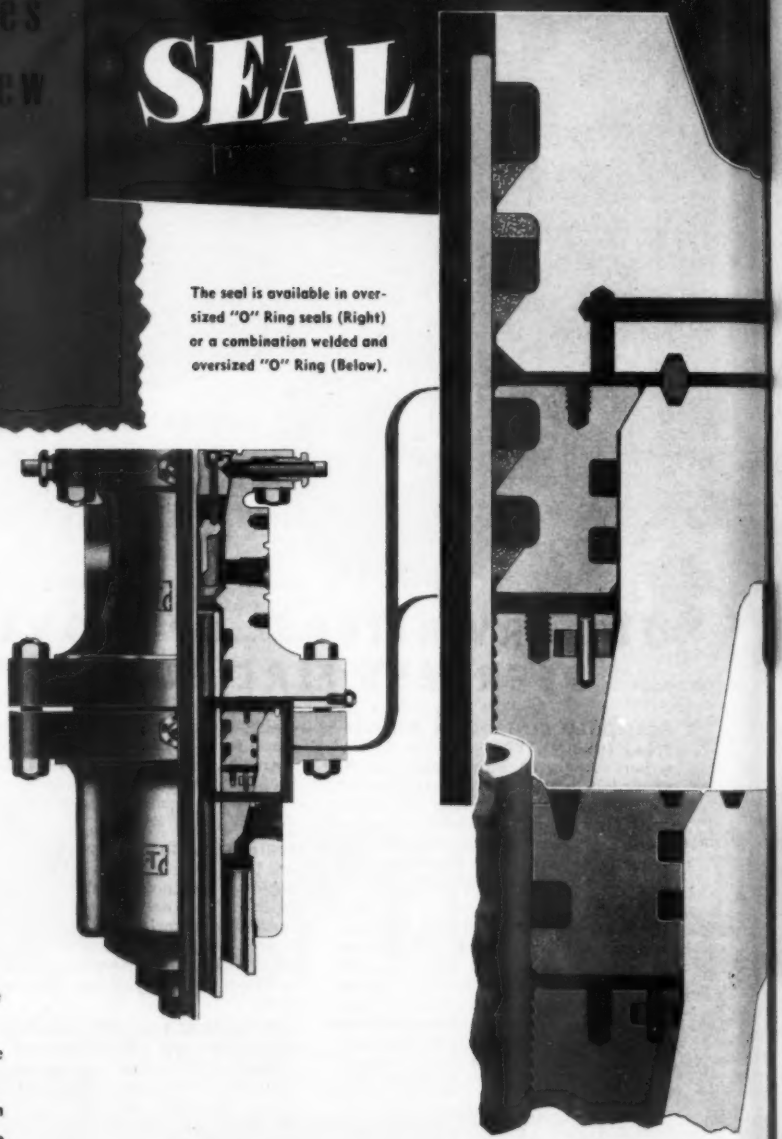
✓IT'S FASTER
✓IT'S SAFER
✓IT'S MORE POSITIVE

when pressure makes the seal in this new

O-C-T

20,000 LB. TEST

AUTOMATIC FLOATING SEAL



The seal is available in oversized "O" Ring seals (Right) or a combination welded and oversized "O" Ring (Below).

Allen screws have been eliminated from the design of the O-C-T "C-18-H" Casing Head and well pressure is utilized to equalize the seal all around the pipe.

That's just one of the features of this advanced design casing head, engineered by O-C-T to meet definite field needs and save the industry time and money.

This new O-C-T C-18-H Casing Head brings new simplicity and flexibility to the low price-high pressure head field along with an extra margin of safety. Check and compare these O-C-T "C-18-H" features and advantages.

1. The automatic floating seal is tested to 20,000 lbs.
2. The seal unit is separate from the slips. Thus, the test load is applied to the automatic sealing element and not to the slips. This feature removes any possibility of collapsing or crushing the pipe with test loads.
3. The test load is applied to the heavy bevel on the body.
4. All extra heavy seals are backed up by extrusion rings which conform to the plus or minus API tolerance of the casing.
5. Corrosive gas and fluids are sealed off from the API Metal Ring Gasket between flanges.

Write today or ask your O-C-T Representative for complete engineering specifications and prices.

OCT PRODUCTS—dependable and available through more than 700 supply store locations.

Oil Center Tool Co.

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Export Representatives: Venezuela, Colombia, Peru and Ecuador—Berry & Hall, Apartado No. 226, Maracaibo, Venezuela. Sterling Areas—La Grand, Sutcliff & Gelt, Ltd., Southall, Middlesex, England. Add-ess Export Inquiries for All Other Countries to P. O. Box 3091, Houston 1, Texas.

ONE is always Outstanding!

The U. S. Open Golf Championship attracts the world's greatest golfers in a competitive display of skill, precision and power. Only the best survives to capture the crown. First played at Newport Golf Club, Newport, R. I. in 1895. The event has been continuous except for the war years. The 1950 "open" is scheduled for Marion Golf Club, Ardmore, Pa. on June 8, 9 and 10.

The high quality performance of Jones sucker rods is the end result of a combination of factors. Among these, skill and experience in production are not the least important. In threading pins and couplings, for example, a battery of specially designed automatics are operated by highly trained technicians to attain close tolerances well within API specifications. Thread finish is accurate and smooth. The pin shoulder is uniformly square with the coupling axis. Threads mesh smoothly and easily... joints snap tightly together...resist strain and shock and deliver dependable operating performance. That's another reason why the familiar green rods are the popular favorites in fields everywhere. Write for detailed information.

THE S. M. JONES COMPANY
(Subsidiary of Buffalo Bolt Company)
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Sales Office: Kennedy Building, Tulsa, Okla.
Export Sales Office: Buffalo International Corp.
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The Best by Any Test!

XUM

This is Why the Nash is the Most Simple Compressor

It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs. pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods. Data on these pumps sent immediately on request.

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

Desired delivery temperature automatically maintained.

Slugs of liquid entering pump will do no harm.

75 pounds in a single stage.

NASH ENGINEERING COMPANY
322 WILSON, SO. NORWALK, CONN.

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1
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ATLAS "Built-In Stamina" MAKES

1 OUTLAST 3 OTHERS

PERFORMANCE-PROVED . . .
SALES-TESTED FOR CUSTOMER SATISFACTION

Out of New England comes more proof of Atlas "built-in stamina." Atlas Roller Chain installed on a grueling, "chain-killing" drive has already outlasted three ordinary roller chains . . . and is still going strong.

No wonder cost-conscious chain buyers in the Petroleum Industry are specifying Atlas . . . for pumping units, drilling rigs, pumps, trucks and all other types of machinery where going is tough.

The extra stamina in Atlas "Super Life" Chain is the result of special heat treating of every component part.

The bushings and pins are case hardened by the Atlas Nicarb Process which provides an outer surface strongly bound to the core of the steel.

The link plates and rollers are also made of tough, heat-treated, alloy steel; their uniformity achieved by automatic electronic instruments controlling the furnaces.

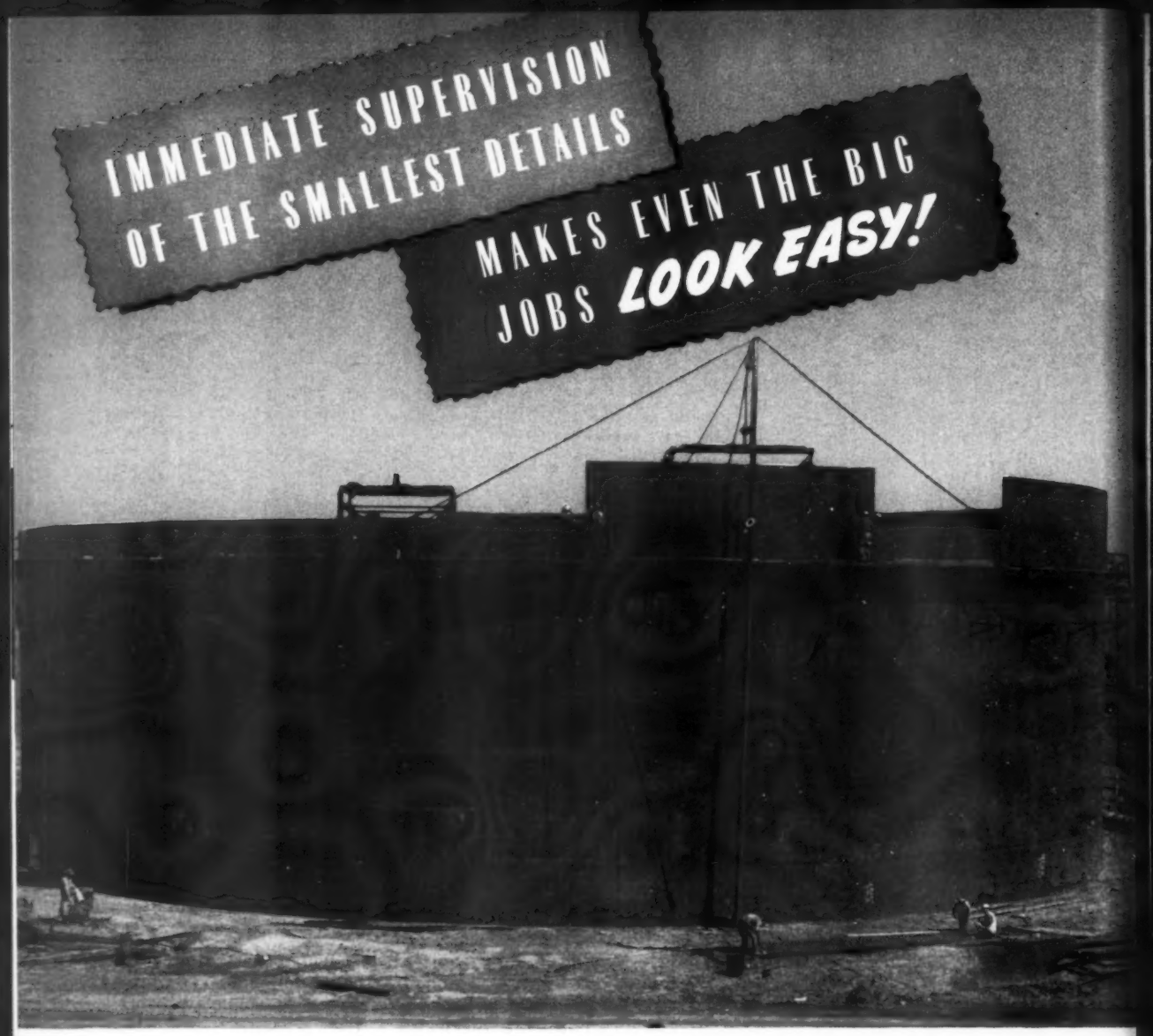
Take advantage of this extra life built into every length of Atlas long-life precision chain. Install it on your present equipment . . . specify it on new equipment. Call your Atlas distributor or write . . .

Atlas Chain & Manufacturing Co., Philadelphia 24, Pa.

"SUPER-LIFE"

ATLAS CHAIN

XUM



TANK ERECTION • TANK REPAIRING • TANK DISMANTLING • TANK MOVING • INDUSTRIAL PIPING • TANK FABRICATION • PIPING FABRICATION • COMPLETE CONSTRUCTION FACILITIES.

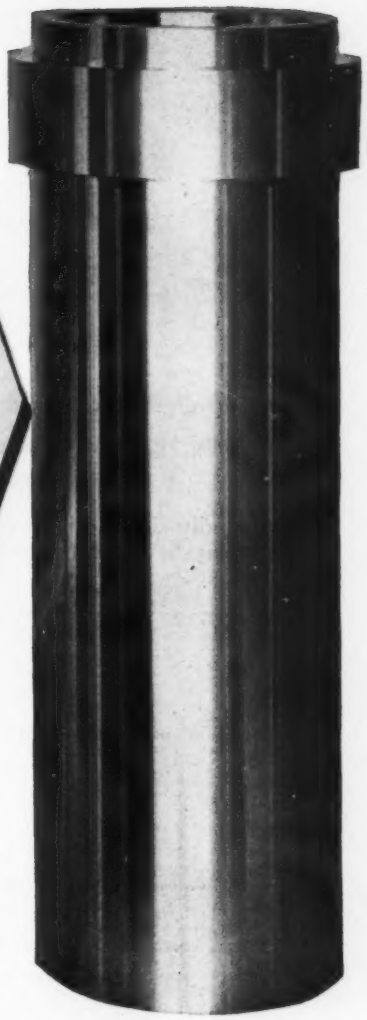
On this job at a Tulsa, Oklahoma, refinery . . . as well as on every Ellerbee Brothers job . . . key supervisory personnel was always available to give personal supervision of every detail. Thus, Ellerbee Brothers jobs are never held up for a decision from the home office! Decisions are made on the job by members of the Ellerbee Brothers organization . . . many with more than 20 years' experience in tank erection. We will appreciate an inquiry on your tank erection needs. Write today for the Ellerbee Brothers brochure.

ELLERBEE BROTHERS

P. O. BOX 857 PORT ARTHUR, TEXAS

Personal Supervision adds the finishing touch to every Ellerbee job

The extra life in "TOOL STEEL" PROCESS slush pump liners is equivalent to "stand-by" protection!



Compare these field records:

Fields	"Tool Steel" Liners	Competitive Hardened Liners
Illinois	67,228 ft.	14,231 ft.
Lindsay, Okla.	90 days (av.)	27 days (av.)
Chocolate Bayou, Texas	65,000 ft. (av.)	20,000 ft. (max.)
Texas Gulf	27,000 ft. (av.)	10,000 ft. (av.)
Leeville Field, La.	864 hours	240 hours (max.)
Blue Lake, Texas	40,000 ft. (still in service)	18,000 ft. (max.)

"Tool Steel" precision-made slush pump liners are producing 2 to 4¼ times the footage of ordinary liners! This superior service life can be equalled by no other liners!

Wearing surfaces are 650-740 Brinell and are file hard to a depth sufficient for the life of the liner.

Central stocks maintained by our Agents serve the entire Southwest. Immediate shipment on all popular sizes through your regular Supply Store source. Also made to your specifications.

"Tool Steel" Oil Field Representatives:

General Agent:

H. H. KUMLER CO.
P. O. Box 6125, HOUSTON 6, TEXAS

Sub Agents:

A. J. HAMMETT
505 S. East 17th St., Oklahoma City, Okla.

RILEY MOOS CO.
1209 Maury St., Houston, Texas

H. H. HEAP, JR.
407 W. Second St., Odessa, Texas

M. T. (TOM) HARRELL
1040 Marshall St., Shreveport, Louisiana

BUD BRANDEBERRY
Russell, Kansas

OIL FIELD EXPORT OFFICE
E. L. Carter, 30 Rockefeller Plaza, New York 20, New York

"Tool Steel" PROCESS

The Standard of Quality

for LINERS • SPROCKETS • WASH PIPES • SHEAVES *and other* HARDENED PRODUCTS

THE TOOL STEEL GEAR & PINION CO.
CINCINNATI 16, OHIO, U. S. A.

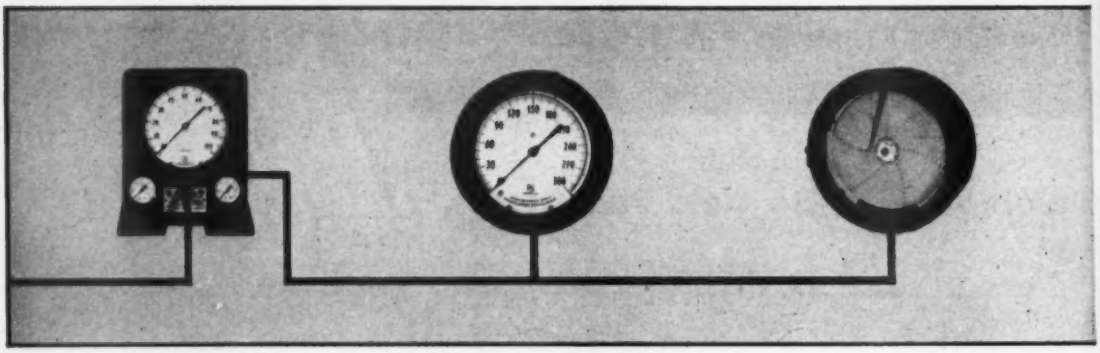
XUM

ASHCROFT TRANSMISSION Score New Advance in the

Ashcroft Pneumatic and Microsen Electric Pressure and Temperature Transmission Systems combine

SIMPLICITY, EASE OF INSTALLATION AND MAINTENANCE . . . LOW COST . . . AND HIGH OVERALL ACCURACY

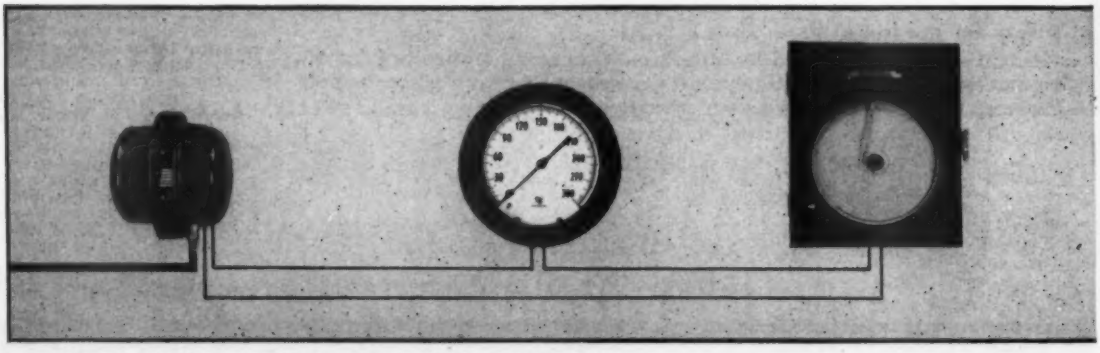
Ruggedly dependable and with unmatched versatility, they provide the economical method of bringing to a central control point a quick, accurate, and complete picture of important process temperatures and pressures.



ASHCROFT PNEUMATIC PRESSURE TRANSMISSION SYSTEMS

Particularly suitable where it is desired to avoid expensive, high-pressure piping or to confine inflammable, hazardous or corrosive liquids and gases close to their source. Pressure indications are transmitted by means of low pressure air over distances up to 1000 feet. Installation costs, leakage and maintenance problems, inherent with high pressure lines, are eliminated. These systems measure pressures up to 50,000 psi, including compound or straight vacuum ranges. There is an extensive selection of Bourdon tube materials and protective devices for all conditions of service.

Temperature Transmission—In addition to pressure measurement, the Ashcroft system can be used to measure temperature in applications where a thermostatic element would be more applicable than thermocouple actuation. Information about these systems available upon request.



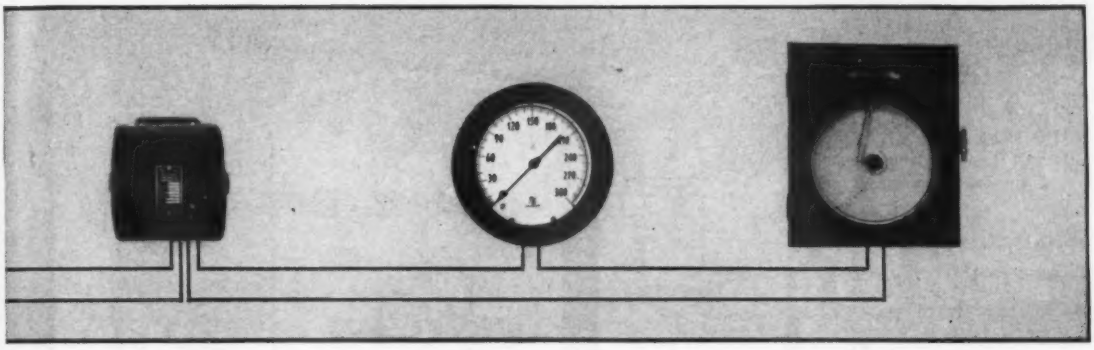
MICROSEN ELECTRIC PRESSURE TRANSMISSION SYSTEMS

Ideal wherever process pressures should be remotely indicated over distances of more than 1,000 feet, where an instantaneous response is desired for control of operation, or where electrical instrumentation predominates.

These systems offer all the advantages of a simple, d-c output signal with accurate, straight-line calibration and the same wide range of pressure elements as Ashcroft Pneumatic Systems for measurements over comparable pressure ranges. The transmitter design insures accurate d-c signals not subject to extraneous a-c interference.

and MICROSEN SYSTEMS

Field of Remote Indication

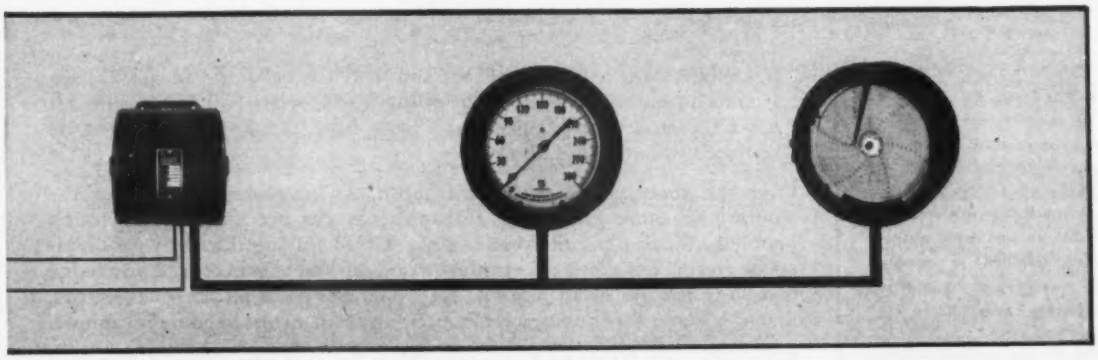


MICROSEN ELECTRIC TEMPERATURE TRANSMISSION SYSTEMS

Designed to meet the need for transmitting temperature indications wherever process temperatures should be indicated at one or more points some distance from the temperature source.

Compact transmitters located near the temperature source reduce thermocouple lead wires to an absolute minimum length. These systems offer all the advantages of a simple, d-c output signal with accurate, straight line calibration.

The transmitter output is conducted over standard, two-wire, copper transmission lines—cheaper to install and maintain than three-wire a-c systems—not subject to extraneous a-c interference.



MICROSEN ELECTRO-PNEUMATIC TEMPERATURE TRANSMISSION SYSTEMS

Provide the most accurate, easily maintained means of converting electrical indications at a remote point into low-pressure, pneumatic signals for temperature indicating, recording and control. Transmitters are located near the temperature source to reduce thermocouple lead wires to an absolute minimum.

The use of low pressure air as the transmitting medium eliminates any possibility of fire or explosion hazards, reduces installation costs, leakage and maintenance problems.

THE VERSATILITY OF MICROSEN TRANSMITTERS

Beyond the transmission of pressures and temperatures, these instruments can be used for transmitting, amplifying or relaying a wide variety of electrical measurements. Typical fields of application available upon request.

A PRODUCT OF

MANNING, MAXWELL & MOORE, INC.

STRATFORD, CONNECTICUT

Makers of 'Ashcroft' Gauges, 'Hancock' Valves, 'Consolidated' Safety and Relief Valves, 'American' Industrial and 'Microsen' Electrical Instruments. Builders of 'Shaw-Box' Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties.

Take an Idea

ON A NEW USE FOR A JET

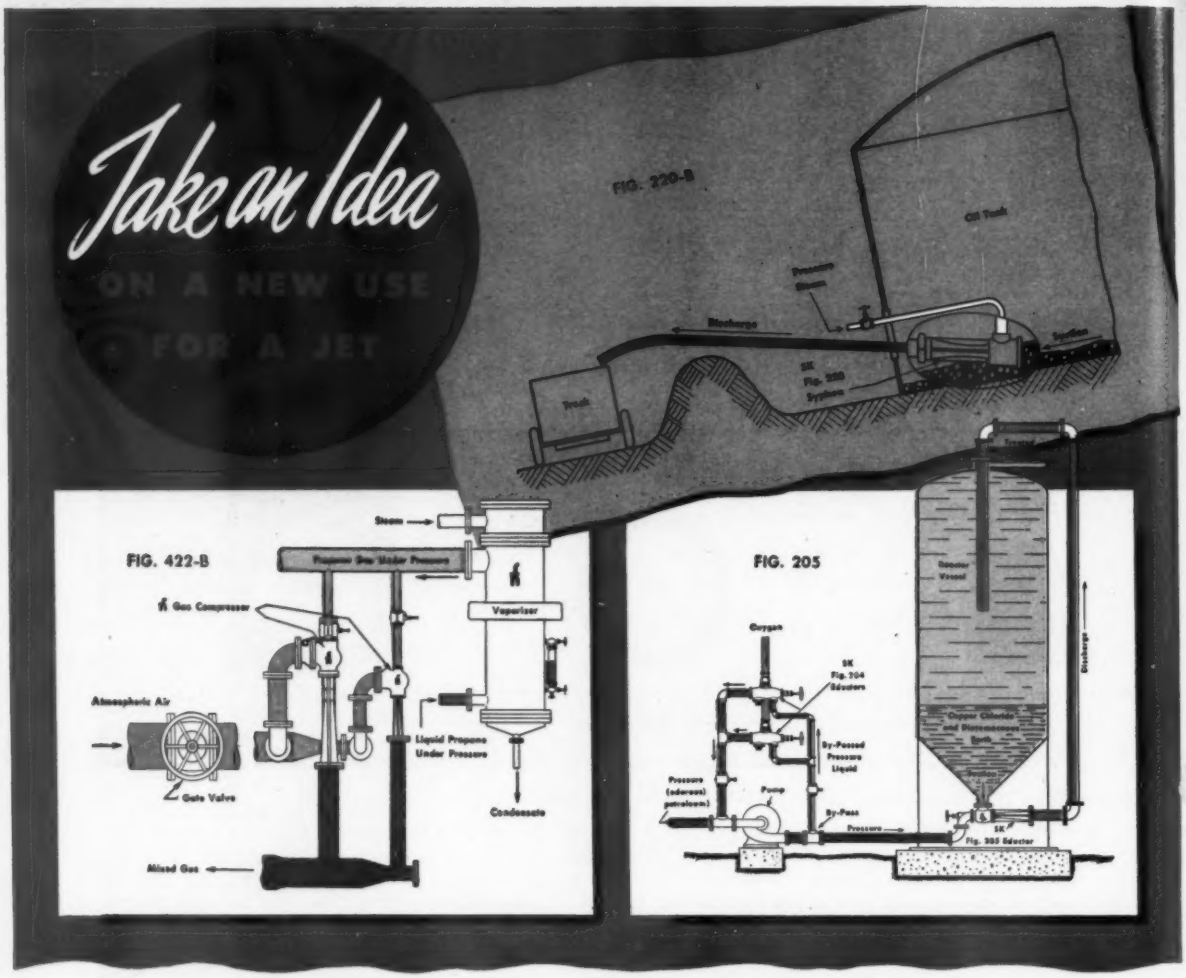


FIG. 220-B. In this application, an SK Fig. 220 Steam Jet Syphon is used to clean sludge from the bottom of an oil tank.

FIG. 422-B. Two SK Gas Jet Compressors are used to mix propane gas under pressure with atmospheric air. Variations in capacity and the proportion of the mixture can be closely controlled.

FIG. 205. In this application two SK Fig. 204 Water Jet Eductors and an SK Fig. 205 Eductor are being used in a process designed to convert malodorous compounds in petroleum products into compounds with a marketable odor.

TURN it over to SK engineers and watch it develop—in most cases, into an economic method of doing a job better and faster with SK *"Job Engineered"* Jet Apparatus. That's how the applications you see illustrated above came about.

Over the years, many petroleum engineers have come to SK for the solution to some producing, transporting, gas processing, or refining problem. Working with these engineers, and solving the many problems encountered, has given SK employees a wealth of engineering knowledge involving the use of all types of Jet Apparatus from Steam Jet Injectors, through Water Jet Eductors, Jet Primers and Exhausters to Fume Scrubbers.

We CAN help YOU with your problem by recommending a standard product, designing a new model or, if an engineering analysis indicates that Jet Apparatus cannot meet your requirements, by frankly informing you of the facts and recommending some other type of equipment.

To give you some idea of the equipment available, we offer our Folder of Jet Apparatus. Send for it.

Representatives in: Atlanta, Baltimore, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Houston, Indianapolis, Kansas City, Los Angeles, Memphis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, St. Louis, St. Paul, San Francisco, Seattle, Tulsa, Montreal and Toronto, Canada.

SCHUTTE and KOERTING Company

Manufacturing Engineers

1175 THOMPSON STREET • PHILADELPHIA 22, PA. • TWX No. PH 782

JET APPARATUS • HEAT TRANSFER EQUIPMENT • STRAINERS • CONDENSERS AND VACUUM PUMPS • OIL BURNING EQUIPMENT • ROTAMETERS • FLOW INDICATORS • RADIAFIN TUBES • VALVES • SPRAY NOZZLES AND ATOMIZERS • GEAR PUMPS • DESUPERHEATERS

Assured Quality

The quality of any weld—its strength, ductility, grain structure, machinability, surface finish—depends largely on the rod used to make it. Only the best rods consistently give good welds of uniformly high quality. Only the best can help you to weld better and faster at lower cost . . . and help to make your job easier, too.

There are two good reasons why OXWELD Welding Rods are the best that modern science knows how to make. First, their rigid specifications are carefully worked out in LINDE research laboratories, which are among the largest and best equipped in the world. Second, LINDE engineers at production points constantly check during manufacture to see that the rods conform to these specifications.

They inspect ingots and billets, sample heats for chemical analysis, make flame and weldability tests, weld and test coupons for strength and ductility. In short, every known precaution is taken to maintain a uniformly high standard.

Every OXWELD Welding Rod that goes to market is of proved physical and chemical analysis . . . free from all objectionable properties and impurities. The OXWELD trade-mark is your guarantee of quality and satisfaction.

The terms "Oxweld," "Prest-O-Weld," and "Purox" are registered trade-marks of Union Carbide and Carbon Corporation.

These 5 Rods Handle a Complete Range of Welding

OXWELD NO. 1 H.T.

OXWELD No. 1 H. T. Steel

For all high-strength steel welding. Develops tensile strengths 11,000 lb. per sq. in. higher than ordinary steel.

OXWELD NUMBER SEVEN

OXWELD No. 7 Drawn Iron

A remarkably ductile, copper-coated rod for all run-of-shop steel welding on materials up to ¼-inch thick.

OXWELD NO. 25 M. BRONZE

OXWELD No. 25M Bronze

A superior rod for all braze-welding, building up wearing surfaces, and fusion welding of copper alloys.

OXWELD NO. 23

OXWELD No. 23 Aluminum

For all-purpose welding of aluminum and its alloys. Prevents weld cracking by absorbing cooling stresses.

OXWELD No. 9 Cast Iron

An ideal rod for fusion welding gray iron castings. Weld metal is fine-grained, soft, and easily machined.

9 additional welding rods and 8 hard-facing rods for more specialized work.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

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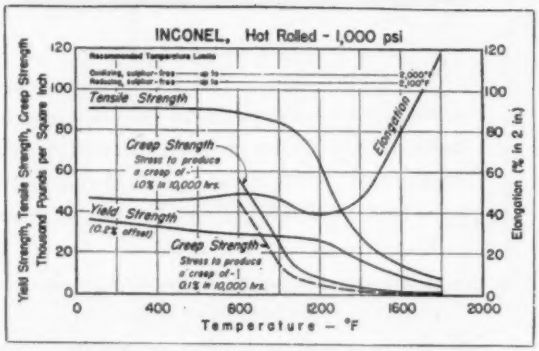
Specify INCONEL . . . the ECONOMY metal for HIGH-TEMPERATURE chemical processing

1. HIGH STRENGTH

2. OXIDATION RESISTANCE

3. RESISTANCE to CHEMICAL ATTACK



Tensile properties of hot-rolled Inconel.

INCONEL IS STRONG

Strength, especially *hot-strength,* is the quality designers look for first in metals to be used in high-temperature applications.

INCONEL* *has exceptionally high hot-strength.*

In the heat-treating field, where equipment is constantly exposed to red-heat temperatures, INCONEL has repeatedly set long-time performance records. One fixture made of INCONEL carried full work loads for 13,000 consecutive hours at operating temperatures of 1600° to 2150° F.

INCONEL RESISTS OXIDATION

A metal may resist oxidation at normal temperatures . . . but will it resist oxidation at the high temperatures necessary in processes like natural gas cracking?

INCONEL *will!*

Here's proof: In high-temperature enamel-setting furnaces where oxidation spalling of fixtures cannot be tolerated for fear of ruining expensive finishes — you'll find INCONEL hanger bars standard equipment. INCONEL's tightly-adhering oxide film does not scale to cause product contamination.

INCONEL RESISTS CORROSION

Where atmospheres are sulfur-free, INCONEL has a plant-proved performance record in successfully handling hot corrosive chemicals such as fatty acids, molten salts, burning gases, sintered metals, ore reductions, and certain organic chemicals at elevated temperatures.

INCONEL IS ECONOMICAL

Get a quotation on INCONEL. You will find it less than you would probably expect. In addition, INCONEL's superior service life and low maintenance requirements often result in outstanding long-run economies.

For economy *plus* serviceability . . . *choose* INCONEL. INCO's Technical Service will gladly help with your specific problems. Your inquiries are always welcome!

*Reg. U. S. Pat. Off.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

*INCONEL** . . . for long life at high temperatures

No. 212 BLOWOUT PREVENTER

SAFETY, EFFICIENCY ECONOMY

RATIGAN

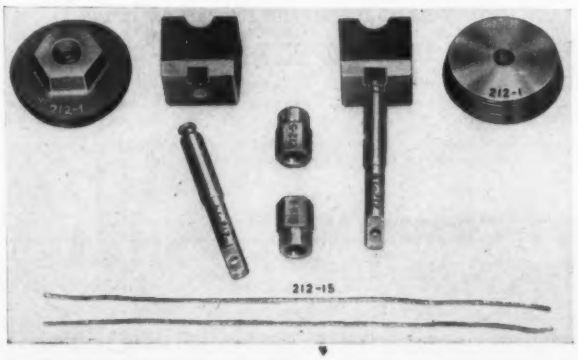
Can Be Used For Swabbing; Or Running Rods In Wells That Head Or Flow In The Course of Operations . . . Features Fast, Easy Changing Of Rubbers

Ratigan No. 212 Blowout Preventer is one of the most outstanding devices in the oil fields and embodies important advanced features essential to maximum safety, efficiency and economy.

The Ratigan No. 212 is manufactured in 2½" and 3" sizes. The 2½" size is supplied both plain and upset. The 2½" plain can be furnished in double female, but if male and female are required, a short nipple can be used to accomplish this. The 2½" upset can be made in male and female or double female. The 3" size is supplied male and female only; however, the male connection easily can be converted to female by installing a 3" collar, thus making a double-female unit. Two of these blowout preventers of the same size, with a nipple of any required length in between make a very efficient unit for swabbing.

New type retractable rubbers are easily and quickly changed simply by unscrewing the plugs at each end . . . part no. 212-1. When the plugs are unscrewed, the old rubbers are readily accessible for replacement.

The No. 212 Ratigan Blowout Preventer has a capacity of 3,000 pounds, yet only weighs 41 pounds.



All Ratigan Products Are Illustrated and Described In The Latest Composite Catalog

J. P. RATIGAN, Inc.

1213 South Santa Fe Ave.,
Los Angeles 21, California

RATIGAN PRODUCTS ARE SOLD THROUGH LEADING SUPPLY STORES

Export: National Supply Export Corp., 30 Rockefeller Plaza, New York City

Aiming for higher octanes?

See how THIS Mercaptan Removal Process replaces doctor treating AND

- *reduces TEL requirements*
- *gives you low operating costs*
- *requires a minimum of new equipment*

More than seven years of commercial refinery operation have proved conclusively the high efficiency of the Tannin Solutizer Process* for mercaptan removal. This is the process that brings your equipment up to "new plant" standards in the economical treatment and blending of higher octane gasolines, *without* affecting the stability of the treated product.

Converting to the Tannin Solutizer Process requires a minimum investment in new equipment . . . very likely your present equipment will serve with little change.

Operating economy is an outstanding advantage of the Tannin Solutizer Process. Still another important consideration . . . *this process is not corrosive;* does *not* require equipment of special alloys.

Complete engineering service is available . . . to help plan your unit, to supervise start-up, to assist in later operation if required. We welcome the opportunity to work with you in achieving the many benefits of the Tannin Solutizer Process.

**The Tannin Solutizer Process is licensed under the patent rights of Socony-Vacuum Oil Company and Shell Development Company.*

SHELL DEVELOPMENT COMPANY
50 West 50th Street, New York 20, New York

SHELL

FABRICATION FACILITIES

TANKS BY BANKS

Modern facilities for the fabrication of any specification from a small tank to heavy refinery equipment, including steel plate 1½ inches thick in rolled sections and 12 inches thick in flat sections.

DALLAS TANK COMPANY, INC.

201-5 W. Commerce Street • P. O. Box 5387

DALLAS, TEXAS

Save with Safety!

CUT INSTALLATION COSTS!
Eliminate need for costly firewalls, extended shafts and stuffing boxes. No need for costly shelters.
CUT MAINTENANCE COSTS!
All joints and seals are metal to metal . . . there are no packings or gaskets to wear out or to replace.
CUT INSURANCE COSTS!
Underwriters' Approval for Class I, Group D, and Class II, Groups F and G, locations with Allis-Chalmers explosion-proof motors.
ALLIS-CHALMERS
Explosion-Proof
MOTORS

Two 100 hp Allis-Chalmers explosion-proof motors driving butane pumps in a large Midwest refinery.

EXPLOSION DANGER was greatly reduced with installation of Allis-Chalmers explosion-proof motors as butane pump drives in this refinery.

Note the simple, compact construction of the Allis-Chalmers motors in the installation above. Air for ventilation is drawn through the motor by a fan inside the fan cover and evenly distributed around the stator.

Allis-Chalmers has also developed a new tube-type, totally enclosed, explosion-proof motor for petroleum application requiring larger sizes. This motor is self-cleaning. Cooling air flows through straight, smooth tubes. There are no recesses to collect moisture or dirt. Heat exchanger type of cooling reduces weight of the motor.

Explosion-proof motors are now available with Underwriters Laboratories' label up to 800 hp, 3600 rpm. Still larger motors for hazardous locations are available in sizes 3000 hp and larger.

For more information on explosion-proof motors from 1 to 100 hp, get Bulletin 51B6145A; for tube-type motors to 800 hp, get Bulletin 51R7149; for larger totally-enclosed motors, get Bulletin 05B7150.

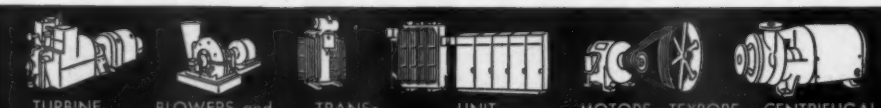
A-3087

ALLIS-CHALMERS, 1059A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-CHALMERS

Texrope is an Allis-Chalmers trademark.

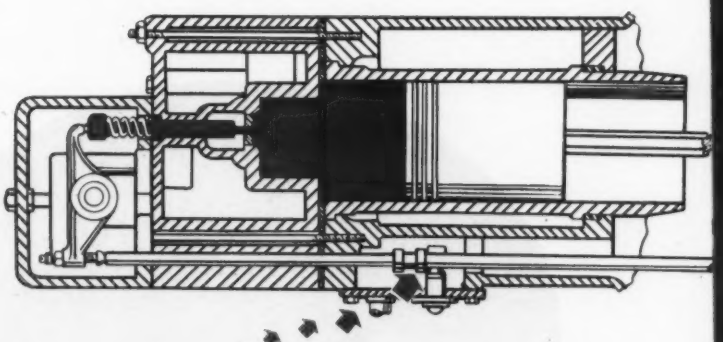
Power, Electrical, Processing Equipment for Petroleum Industry



Easy to Start

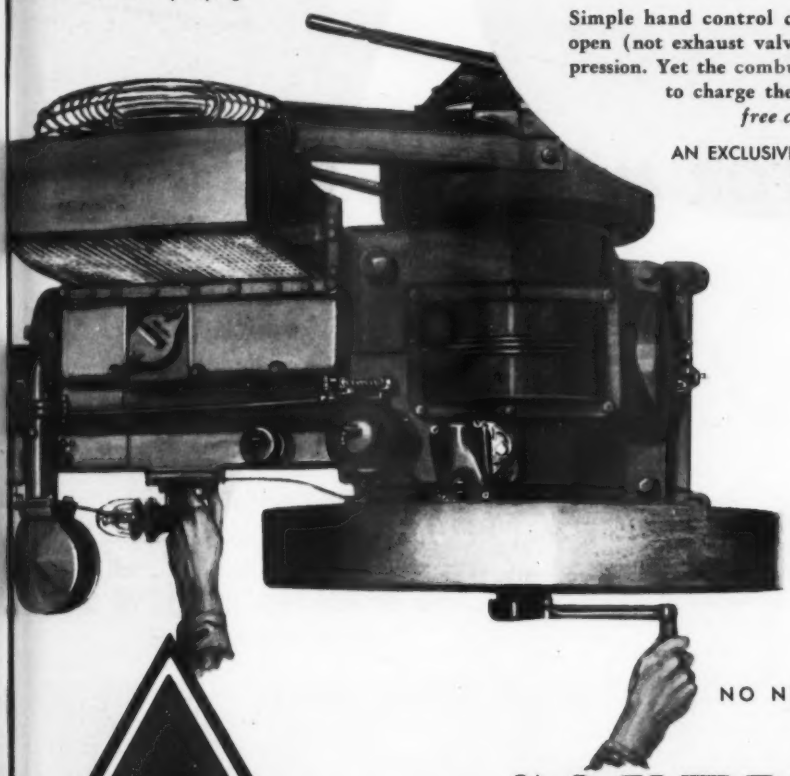
CSCO
PUMPING ENGINES

It is an unusual and satisfying experience to start a CSCO Pumping Engine. For a CSCO *is easy to start*, as witnessed by thousands of operators during the past four years... under every condition in all sections. In designing the CSCO, easy, safe starting was a must! There's no long, back-breaking tugging... *it's off with the first spark.* A CSCO is safe, too... *it can't kick back.* Easy and safe starting... one of the many reasons why the CSCO is your best bet for better pumping.



Simple hand control cam holds INLET VALVE open (not exhaust valve), thereby releasing compression. Yet the combustible mixture is allowed to charge the cylinder during *free cranking.*

AN EXCLUSIVE CSCO FEATURE !



THE CSCO RIDES THROUGH COMPRESSION

A flip of the release cam and the flywheel momentum rides through the compression of the combustible mixture. One spark and it's off!

SAFE—because it can't kick back!

EASY—there's little difference in effort between the sizes.

NO NEED FOR EXPENSIVE STARTERS!

CONTINENTAL

SERVING THE OIL AND GAS INDUSTRIES

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The Continental Supply Company, Limited, 216 Lancaster Building, Calgary, Alberta

***Export Division:* The Continental Supply Co., Inc., 30 Rockefeller Plaza, New York, N. Y.**

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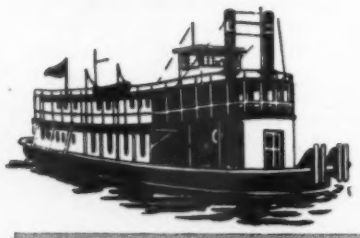

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Call Avondale!

Tomorrow, the next day — who knows when? You may suddenly have need for expert repair or construction. In such case, call experts — call AVONDALE . . . all types of marine work for the oil industry.

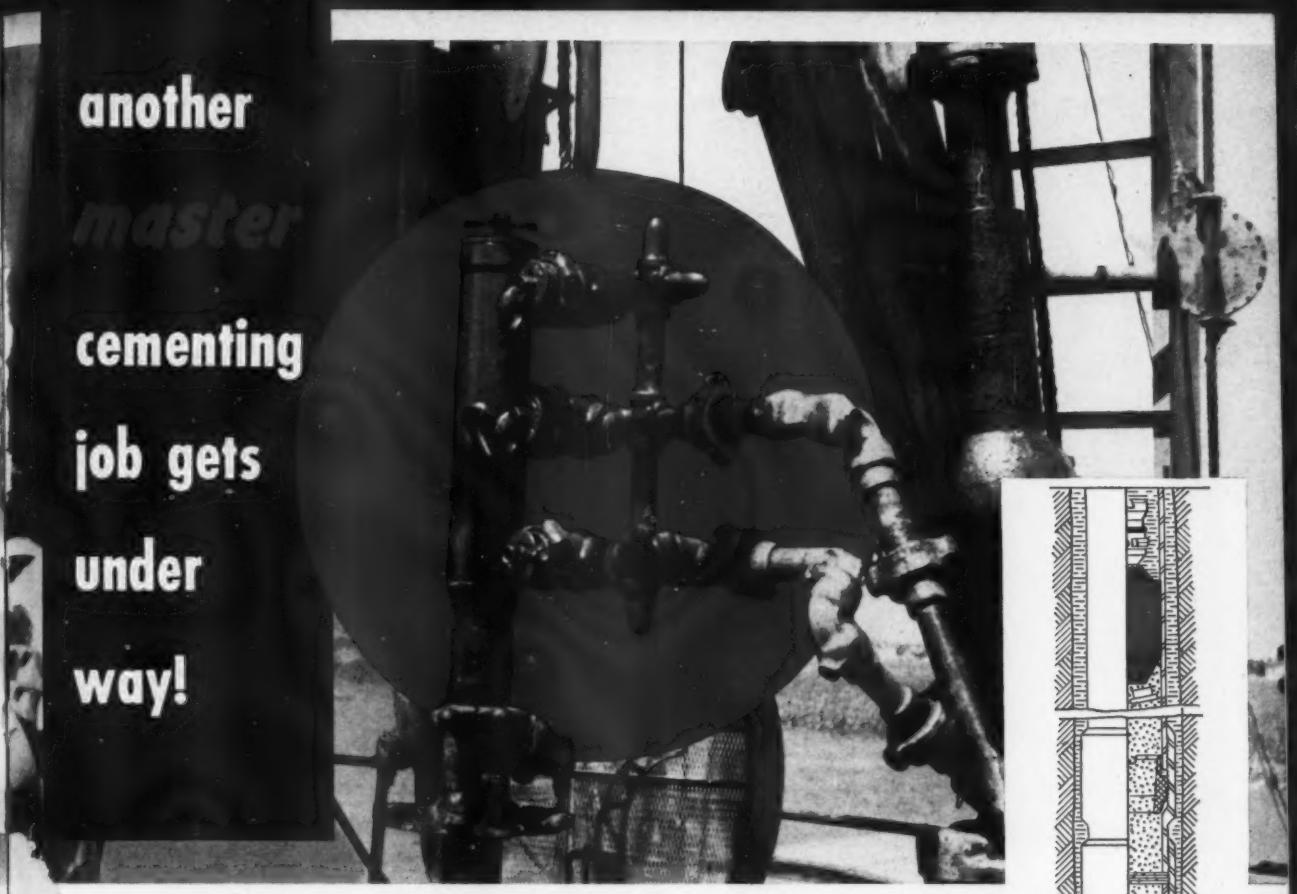
AVONDALE MARINE WAYS, INC.

STEEL

RIVER FRONT, MAILING ADDRESS: NEW ORLEANS DISTRICT WESTWEGO, LOUISIANA

MAIN PLANT: AVONDALE, LA.
QUICK REPAIR PLANT — HARVEY, LA.

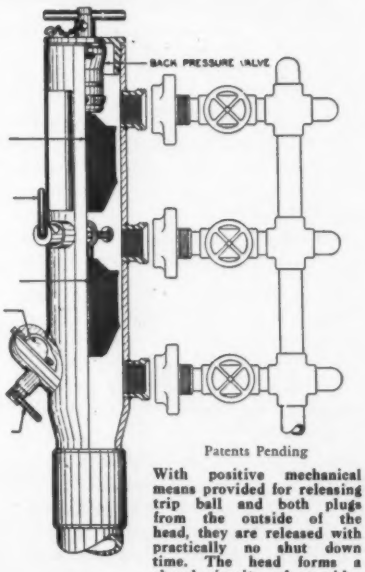
another *master* cementing job gets under way!



perators knows in advance he will have a master ce-
g job, because he is using the Rector "Fulbore" Two
Method.

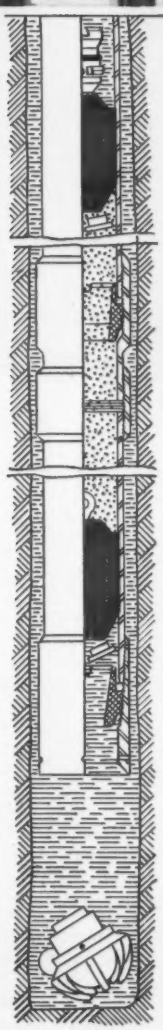
With the cement column separated from mud fluid by the
lugs, he knows uncontaminated cement will be delivered
the casing shoe. With the float assembly ejected from the
e, he will get greater discharge capacity at lower pressure
. the uniform body of cement minimizes hazard of channel-
g. He knows cement cannot back up in casing string when
e back pressure valve seats in the stall collar . . . that air
trainment in the cement column is prevented by the closed
rcuit, plug retainer type cement head.

Rector "Fulbore" Two Plug Cementing Method is the
aster of efficient, effective cementing. Ask your nearest
ECTOR REPRESENTATIVE, SUPPLY MAN, OR
LACKIE CLARK WELL SERVICE COMPANY for
ll details or write for bulletins.



Patents Pending

With positive mechanical means provided for releasing trip ball and both plugs from the outside of the head, they are released with practically no shut down time. The head forms a closed circuit and provides shut in control at all times during the operation.



ECTOR WELL EQUIPMENT CO., INC.

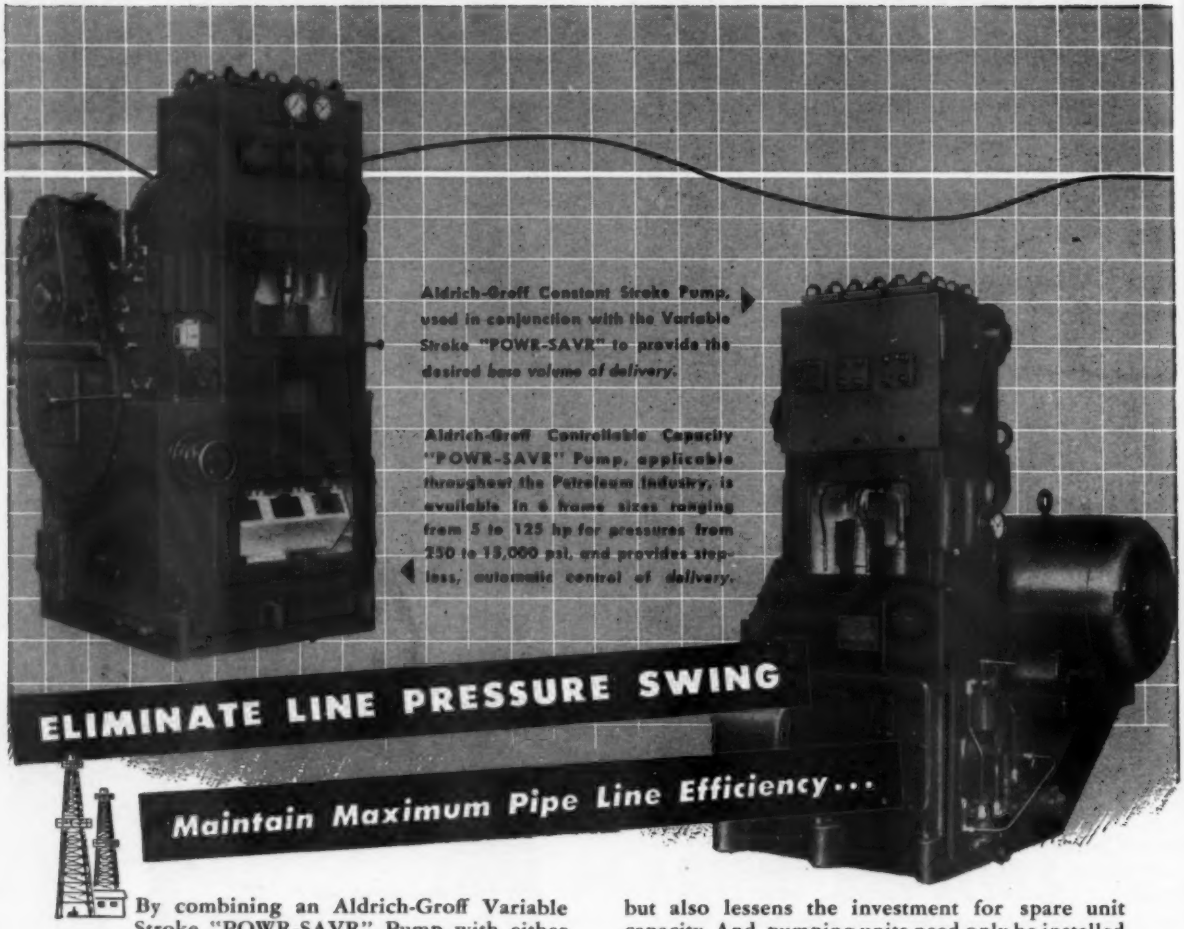
FORT WORTH, TEXAS

Worth Plant ..... 1100 N. Commerce St.
uston Plant ..... 2215 Commerce St.

REPRESENTATIVES IN ALL ACTIVE FIELDS

RECTOR FULBORE CEMENTING METHOD

ASK YOUR SUPPLY STORE FOR RECTOR "FULBORE" CEMENTING EQUIPMENT


Aldrich-Groff Constant Stroke Pump, used in conjunction with the Variable Stroke "POWR-SAVR" to provide the desired base volume of delivery.
Aldrich-Groff Controllable Capacity "POWR-SAVR" Pump, applicable throughout the Petroleum Industry, is available in 6 frame sizes ranging from 5 to 125 hp for pressures from 250 to 15,000 psi, and provides stepless, automatic control of delivery.
ELIMINATE LINE PRESSURE SWING
Maintain Maximum Pipe Line Efficiency...

By combining an Aldrich-Groff Variable Stroke "POWR-SAVR" Pump with either its companion Aldrich-Groff Constant Stroke Triplex Units or an Aldrich Multuplex Pump, you can automatically eliminate line pressure swing and safely maintain the maximum rate of delivery in your line at all times. You can also simplify pump station control and eliminate the expense and objectionable features of station surge tanks.

The development of Aldrich-Groff Variable Stroke and Constant Stroke Pumps—to embody *interchangeable fluid-end* and *principal power-end parts* — constituted another notable Aldrich "First". These units are serving on a number of modern high pressure pipe lines with the satisfactory results indicated by repeat orders.

Variable Stroke Pumping Capacity need only cover throughput variations incident to temperature and viscosity changes. The bulk of the installed capacity may be of the less expensive Constant Stroke Units. Such a multiple unit installation not only affords pumping flexibility and extreme reliability, but also lessens the investment for spare unit capacity. And, pumping units need only be installed to care for initial line capacity with additional units being added as the line demands build up. This means less initial investment expense and attainment of full load efficiency under all conditions, with consequent savings in pumping power.

Both types of units employ a *conventional fixed throw crankshaft* of solid forged steel construction which has proven to be best adapted for reliable continuous service, as attested by over 500 units installed so far—many with 10 year service records.

Both units feature self-contained reduction gear drive adapted to utilize an efficient high speed motor or turbine (for refinery service) mounted on the pump frame itself. This not only means compactness of floor space and savings in foundation and building costs—but assures accurate mechanical alignment at all times. V-Belt and other forms of engine drive are optional.

Write for Data Sheet 62 or for our representative to call.

Representatives: Birmingham • Bolivar, N. Y. Boston • Buffalo • Chicago • Cincinnati • Cleveland Denver • Detroit • Duluth • Houston Jacksonville • Los Angeles • New York • Omaha Philadelphia • Pittsburgh • Portland, Ore. Richmond, Va. • St. Louis • San Francisco Seattle • Spokane, Wash. • Syracuse • Tulsa

THE ALDRICH PUMP COMPANY

9 GORDON STREET, ALLENTOWN, PENNSYLVANIA

All Aldrich Pumps Have **STAYING POWER**

THE Armstrong hardened chrome steel valve opens wide and closes tight — with a snap! This eliminates throttling and consequent wire drawing. The Armstrong free-floating lever mechanism is almost frictionless. The bucket and valve lever assembly are 18-8 corrosion resistant stainless steel. The mechanisms of Armstrong steam traps for low and medium pressures are identical in materials and workmanship to those used in Armstrong traps for pressures to 1500 psi, 900 F.

There is nothing in an Armstrong trap to bind, stick, collapse or leak. *Now is the time to quit working for your steam traps and buy the traps that will work for you.* Call your nearby Armstrong representative today.

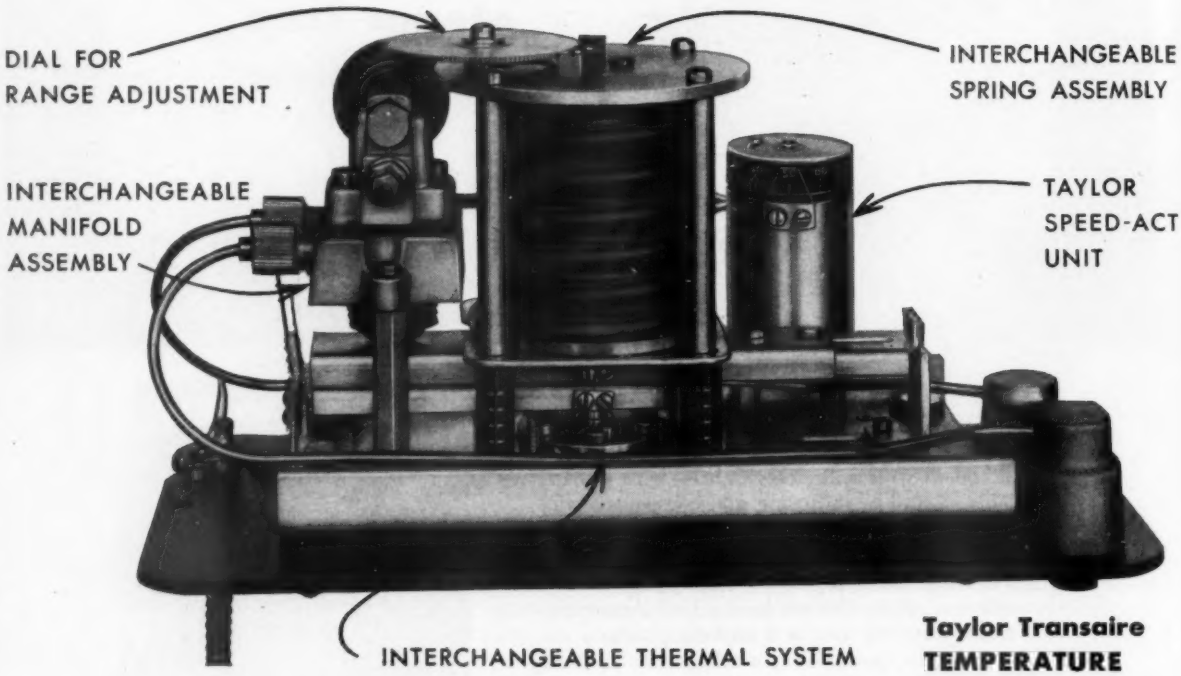
ARMSTRONG MACHINE WORKS
868 Maple St., Three Rivers, Mich.

THE 36-PAGE ARMSTRONG STEAM TRAP BOOK contains complete data on the design, operation, selection and installation of Armstrong steam traps for all services. Send for your free copy.

ARMSTRONG STEAM TRAPS

Already Leading Firms are

TRANSAIRE*



Taylor Transaire TEMPERATURE Transmitter

THAT FIRST FLASH of buyer enthusiasm for new products often dies out quickly. But it's brighter than ever for the new Taylor TRANSAIRE Transmitters —with repeat orders coming in from leading firms the country over.

Until we developed TRANSAIRE Transmitters, measurement of changing temperatures and pressures was always a headache to process engineers. Hundreds of these revolutionary new instruments are now being used successfully by scores of companies. (List available from your Taylor Field Engineer). Whatever your product—TRANSAIRE Transmitters can give *you* the same precise results.

HERE'S WHY:

1. New Taylor TRANSAIRE Temperature Transmitter with Speed-Act* lets you transmit smallest temperature changes up to 1000 feet with unbelievably fast accuracy!

GIVES YOU:

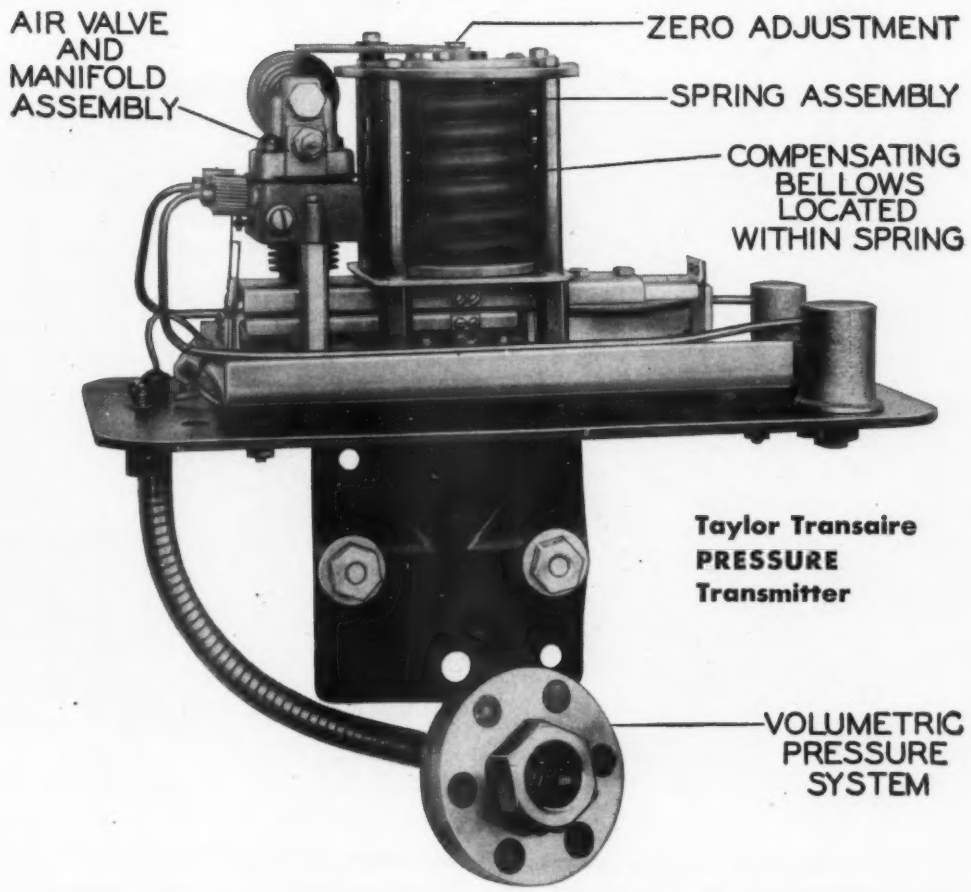
a. Dynamic Accuracy in measuring changing or dynamic conditions. Transaire Dynamic Accuracy is unparalleled. Solves problem of process engineers who realize that accuracy within a fraction of a degree in measuring static conditions can miss by many degrees when temperature is changing.

b. Dynamic Compensation—for inherent lags both in measuring system and rate of heat transfer of process medium. Introduces derivative action (Speed-Act) into *measuring* circuit. Result—Dynamic Accuracy, with a speed of response seldom thought possible, permitting much closer automatic temperature control.

2. New Taylor TRANSAIRE Pressure Transmitter with narrow range spans lets you measure and transmit minute pressure changes up to 1000 feet. Works on simple force-balance principle. Accurate to ½% of the selected short

re-ordering the new Taylor

TRANSMITTERS



range span (*conventional devices are only accurate up to ½% of upper range limit*). Sensitive to pressure changes of ½" water.

Here are a few important advantages:

Range spans of 20 and 40 psi available throughout range limits of 35 to 415 psia.

Volumetric type pressure system is extremely accurate, practically clog-proof, has corrosion-resistant 316 stainless steel diaphragm.

Temperature and barometric compensation for higher accuracy of measurement and control.

For complete details, write for **Bulletin 98140** on TRANSAIRE Temperature Transmitter, and **Bulletin 98099** for TRANSAIRE Pressure Transmitter. Ask your Taylor Field Engineer! Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada.

Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.

*Trade-Mark

"For Safety...For Sureness...

I buy only GENUINE GARDNER-DENVER PARTS"

That's right! You don't have to take chances on slush pump parts. When you reach for the red box with the familiar Gardner-Denver seal —

you know you're getting the best in materials and design, because only Gardner-Denver parts correctly meet original specifications.

you know your pumps will operate at peak efficiency . . . with the power and stamina for which Gardner-Denver Slush Pumps are famous.

Remember—Your Gardner-Denver Slush Pumps are protected best against costly failure if they are fully equipped with genuine Gardner-Denver parts.

Gardner-Denver trained service men are readily available to assist in the installation of Gardner-Denver parts

GARDNER-DENVER *Since 1859*

Gardner-Denver Company, Quincy, Illinois

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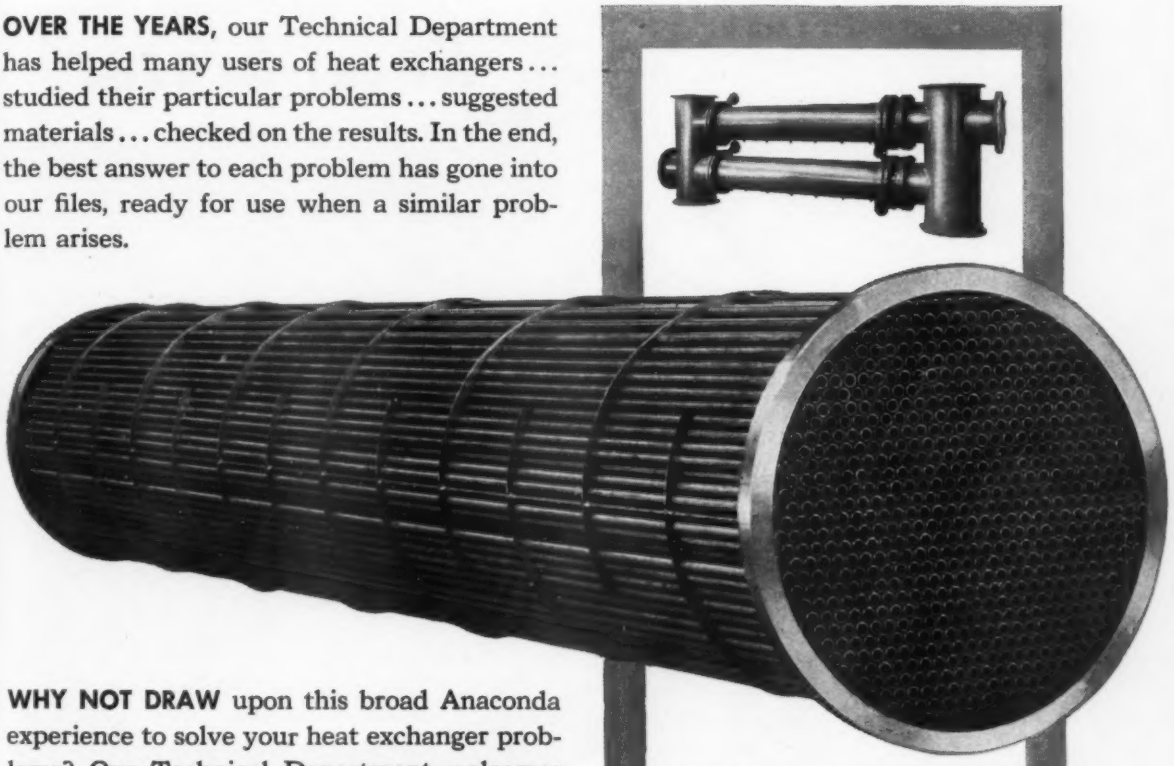
Continental Supply Co., Continental Bldg., Dallas, Texas. Export Division: 30 Rockefeller Plaza, New York, N. Y.
Republic Supply Co. (of Calif.), 2600 S. Eastland Ave., Los Angeles, Calif.

Is your heat exchanger tube and sheet problem

Different? Tougher?

It may seem so to you—but it may not be so to us!

OVER THE YEARS, our Technical Department has helped many users of heat exchangers... studied their particular problems... suggested materials... checked on the results. In the end, the best answer to each problem has gone into our files, ready for use when a similar problem arises.



UPPER PHOTO shows Adams two-shell, single stage aftercooler designed to control temperature of compressed air and to condense water and oil vapors present. The condensate is removed by a separator. Built by R. P. Adams Company, Inc., Buffalo, N. Y.

LOWER PHOTO shows tube bundle for aftercooler. ANACONDA Arsenical Admiralty Tubes, Muntz Metal Tube Sheets and Brass Baffles.

WHY NOT DRAW upon this broad Anaconda experience to solve your heat exchanger problems? Our Technical Department welcomes the opportunity to place it at your service. If you don't already have a copy, let us send you "ANACONDA Tubes and Plates for Condensers and Heat Exchangers." Just ask for Publication B-2. The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Limited, New Toronto, Ont.

80118

For efficient heat transfer **ANACONDA®**

HEAT EXCHANGER TUBES

MARSH

. . . the gauge with the "Recalibrator"

Any pressure gauge can be knocked out of adjustment, but when it's a Marsh Gauge you can quickly correct it with the twist of the "Recalibrator" screw.

This is not only the handiest way to correct a gauge; it is also the best way. Conventional methods of adjustment simply compensate for the error. The "Recalibrator" corrects the relationship between the movement and the bourdon tube—actually *does re-calibrate* the gauge.

MARSH INSTRUMENT CO.

Sales affiliate of Jas. P. Marsh Corporation, Dept. L, Skokie, Ill.

Houston Plant, 1121 Rothwell St.

The Marsh line includes gauges especially designed for blenders, boilers, burners, capping, Christmas trees, columns, heaters, hydrogen units, instrument panels, pumps, Reid vapor bombs, scrubbers, separators, mud pumps, stills, towers and other applications including oxygen and welding gauges. Ask on your letterhead for new catalog just off the press.

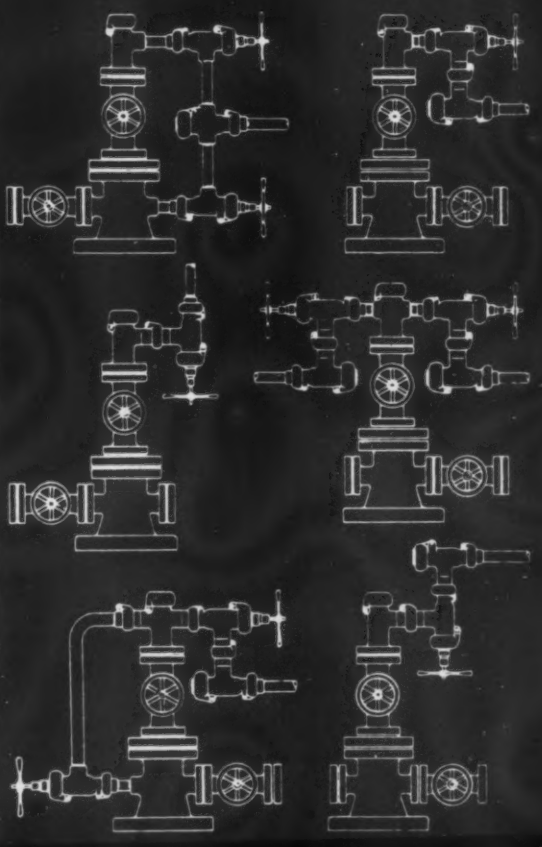
TELL YOUR CHRISTMAS TREE SUPPLIER TO FURNISH

Unibolt

FLOW MANIFOLDS

—THEY MAKE ANY TREE LIGHTER, STRONGER, MORE ECONOMICAL!

UNIBOLT ADJUSTABLE WING VALVES AND POSITIVE CHOKES MAY BE ASSEMBLED IN ANY DESIRED TYPE OF MANIFOLD TO BEST SERVE INDIVIDUAL WELL REQUIREMENTS



The UNIBOLT Flow Manifold was designed to eliminate much of the bulk and weight of conventional flanged Christmas trees, yet, because of the patented UNIBOLT design, this manifold actually provides a higher factor of safety than the heavier flanged manifolds.

The use of a UNIBOLT Adjustable Wing Valve instead of an ordinary gate or plug valve on the wing is an innovation that has met with the approval of numerous operators, due to the fact that it provides a dependable and easy-to-operate wing valve, requires no grease to effect a seal, costs substantially less, and can be completely overhauled without removal from the well.

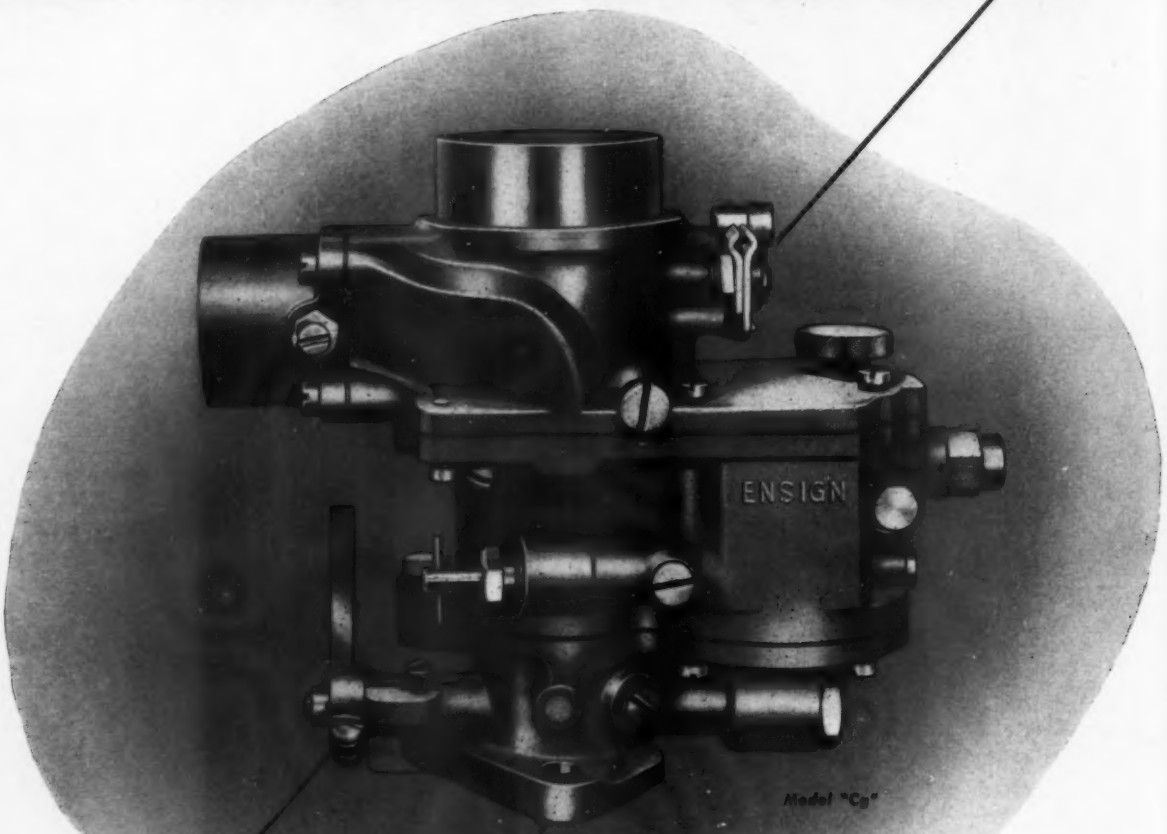
Another important advantage of the UNIBOLT Flow Manifold is its complete interchangeability. All connections in the manifold are standard forged steel UNIBOLT Couplings, and any unit in the assembly, or part thereof, may be easily and quickly replaced in the field without removing the manifold from the well.

See your Composite Catalog for complete details, or write direct for literature.

THORNHILL-CRAVER CO.

HOUSTON UNIBOLT THE ONE BOLT COUPLING **TEXAS**

ENSIGN*



Model "Cg"

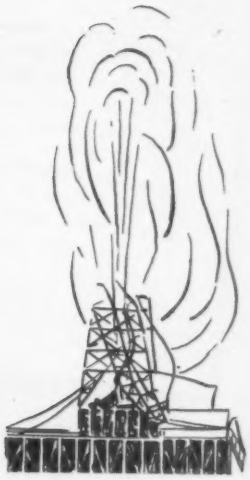
Engines equipped with the Ensign Model "Cg" Combination Carburetor may be operated on either Natural Gas, Gasoline or Butane-Propane. Switching from one fuel to another is easily done with the engine running. Engine builders and users of gas-engine powered equipment specify the combination carburetor when there is some question about the availability of fuel on the job.

ENSIGN
CARBURETOR COMPANY
7010 S. ALAMEDA ST., P. O. BOX 229
HUNTINGTON PARK, CALIFORNIA
Branch Factory: 2330 W. 58th St., Chicago 36, Illinois

"Pioneers in Efficient Carburetion" since 1911

Standing Between You and

Destructive Well Pressures



SHAFFER ROTATING BLOWOUT PREVENTER

equipped with Murray Rubber

Used in conjunction with a ram-type blowout preventer, the Shaffer Rotating Blowout Preventer and Stripper provides an additional safeguard against blowouts and serves numerous needs for drilling and running pipe, particularly in high pressure areas.

A heavy-duty Hycar oil and gas resistant rubber stripper, which is designed to pack-off on the Kelly, tool joints, drill pipe, subs and drill collars, rotates with the pipe and provides a constant seal of the well bore while the pipe is in the hole. This rugged rubber stripper withstands the extreme stresses caused by raising and lowering the Kelly and drill joints through it.

Here is another instance in which Murray's specialized experience in compounding and molding "the right rubber for the job" has contributed directly for the success of a new tool for the oil industry. Extremely close laboratory control and careful molding and finishing of this stripper assures uniform high quality and dependable performance. Certainly, there is no substitute for such experience, coupled with the largest, most modern mold manufacturing and rubber producing plant in the South.

This is the big, rugged, Hycar rubber stripper which is molded by Murray for the new Shaffer Rotating Blowout Preventer and Stripper.

MURRAY RUBBER COMPANY

HOUSTON, TEXAS

BROWN FINTUBE'S 8 advantages

EXTREME FLEXIBILITY
Easily Adapted to Changes in Duty

NO OBSOLESCENCE
Avoiding Waste and Expense

FLANGED HEAD END ASSEMBLY
Eliminating Ground Joint Seals

EASY MAINTENANCE
Using Only Common Tools

CONTINUOUS OPERATION
No Shut-Downs For Cleaning

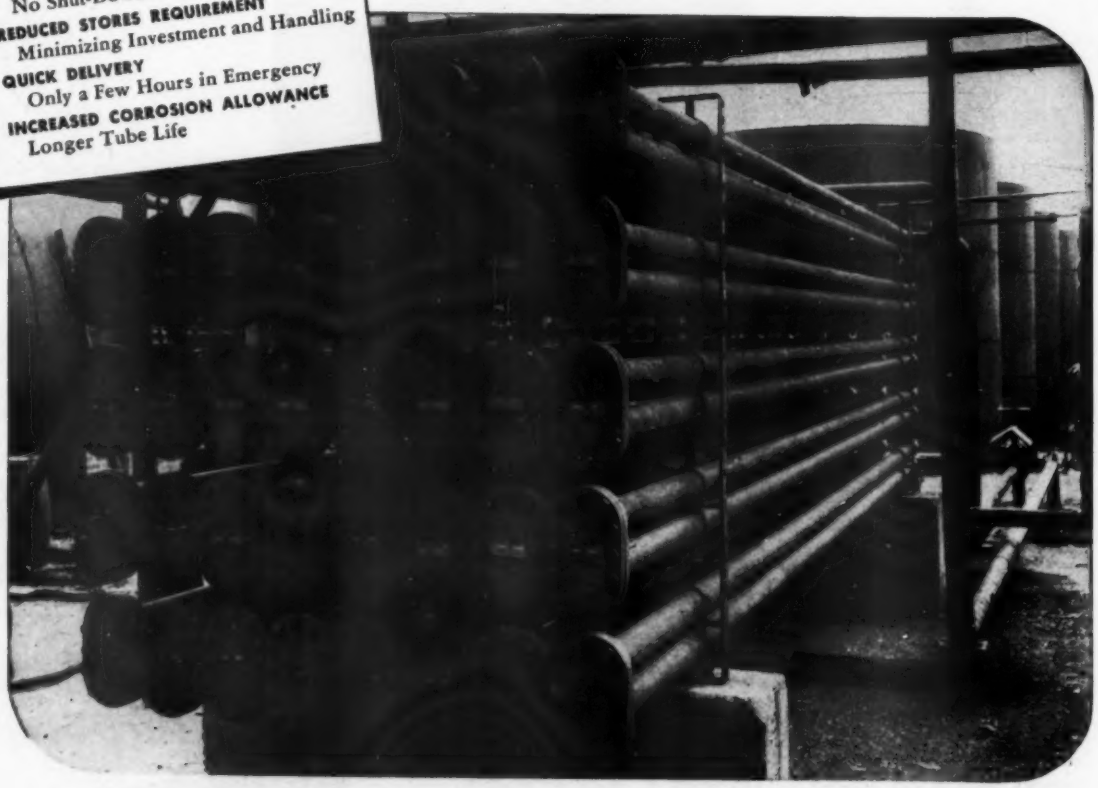
REDUCED STORES REQUIREMENT
Minimizing Investment and Handling

QUICK DELIVERY
Only a Few Hours in Emergency

INCREASED CORROSION ALLOWANCE
Longer Tube Life

no obsolescence

Brown Fintube Sectional Construction Avoids Needless Waste and Expense



● Brown's interchangeability of parts, exacting design and precision manufacture has "licked" obsolescence.

The sections can be used in one exchanger after another — on different duties — on different products. A bank can even be broken up and the sections shipped to two or more plants, miles apart, assembled and reused. Sections not in use serve as "stores" for other sections on stream. They are *never obsoleted* by changes in duty or plant re-arrangements. You can use, and reuse them, until they are completely worn out.

For the utmost in *efficiency* and *economy*, install Brown's proven, welded fintube heat exchangers throughout your plant. Estimates and quotations furnished promptly. *Write for Bulletin No. 481.*

THE BROWN FINTUBE CO.
ELYRIA, OHIO

SECTIONAL HAIRPIN HEAT EXCHANGERS

XUM

STEAM POWER

The above photo shows five 150 H.P. 350 lb. W.P. Lucey Boilers mounted on a Richardson & Bass (Louisiana Account) drilling barge. Installation was made in May, 1949.

DISTRIBUTORS:

Lucey Products Corporation
Tulsa, Oklahoma

Houston Oil Field Material Co., Inc.
Houston, Texas

Jones & Laughlin Supply Co.
Tulsa, Oklahoma

Murray-Brooks, Inc.
Lake Charles, Louisiana

Bethlehem Supply Co. of California
Los Angeles

EXPORT:

Lucey Export Corporation
233 Broadway
New York 7, N. Y.

Broad Street House, E.C. 2
London, England

Lucey Boilers are approved for use in Canada

For off-shore or inland drilling, power-wise and economy-minded contractors use LUCEY Inside Seal-Welded and Double Calked BOILERS. Complete sealing off of all possible joint leakage and seepage assures the highest in everyday performance. Lucey Oil Country Boilers are available from 40 H.P. to 150 H.P., with working pressures from 125 lbs. to 350 lbs.

LUCEY

LUCEY BOILER and MANUFACTURING CORPORATION

Chattanooga, Tenn.

BETHLEHEM SUPPLY CO. OF CALIF.
6000 ALCOA AVENUE, VERNON
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415 STERLING BUILDING
HOUSTON, TEXAS

ALUMINUM . . . BRASS . . . COPPER . . . MONEL*
NICKEL* . . . STEEL . . . STAINLESS STEEL

Sheets • Tubes • Plates • Bars • Fittings • Accessories

Order from your nearby warehouse

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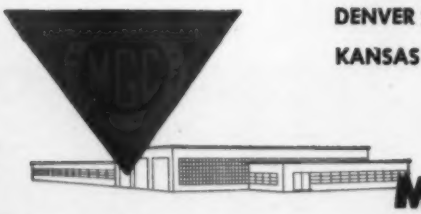
**Not warehoused in Kansas City or St. Louis.*



METAL GOODS CORPORATION

DEEP FRIO SAND IN OLD OCEAN FIELD MATAGORDA COUNTY, TEXAS

Mud (Caustic, Quebracho):
$R_m = .55$ @ B.H.T.
Bit Size: $8\frac{3}{8}$"
Spacings: AM = 16"
AM' = 64"
AO = 18' 8"

LOG ANALYSIS

1) Water saturation S

$R_t = 8.5$ ohms

Departure curves are necessary to establish the value of R_t in the sand from 10,128' to 41' because of bed thickness.

$R_o = 1.2$ ohms in adjacent wells where the sand is below water level.

$$S = \sqrt{\frac{1.2}{8.5}} = 38\%$$

2) Formation water resistivity R_w

with $SP = -70 \log_{10} \frac{R_m}{R_w} = -60$ mv.,

$R_w = .076$ ohms @ B.H.T.

3) Porosity p

$$F = \frac{R_o}{R_w} = \frac{1.2}{.076} = 16$$

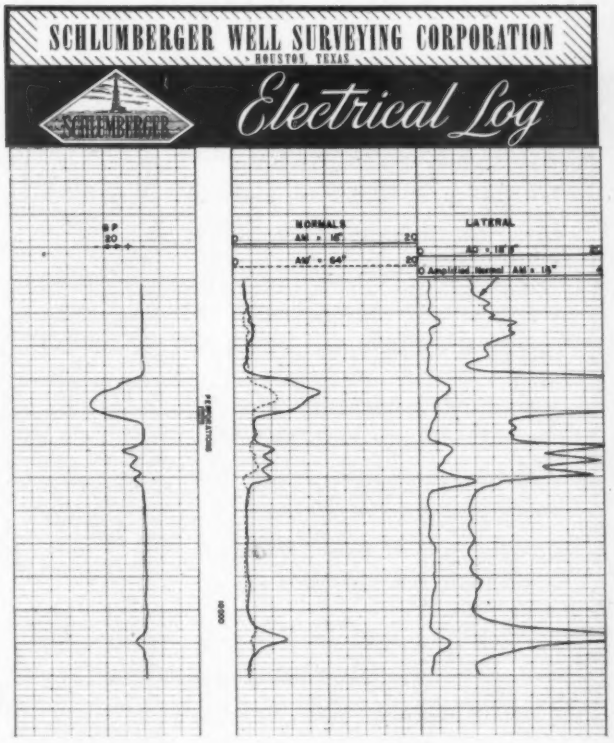
$$p = \sqrt[m]{\frac{1}{F}} = 21.5\% \quad \text{for } m = 1.8$$

CORE ANALYSIS

Average Porosity	24.3%
Average Permeability	248 md.
Residual Water	48.7%
Residual Oil	11.1%
Total Fluids	59.8%
Connate Water	37%

PRODUCTION RESULTS

Production Section:	10138—43'
Production Potential:	194.5 BOPD 37° API
Gas/oil ratio:	1141/1
Water:	25.1%

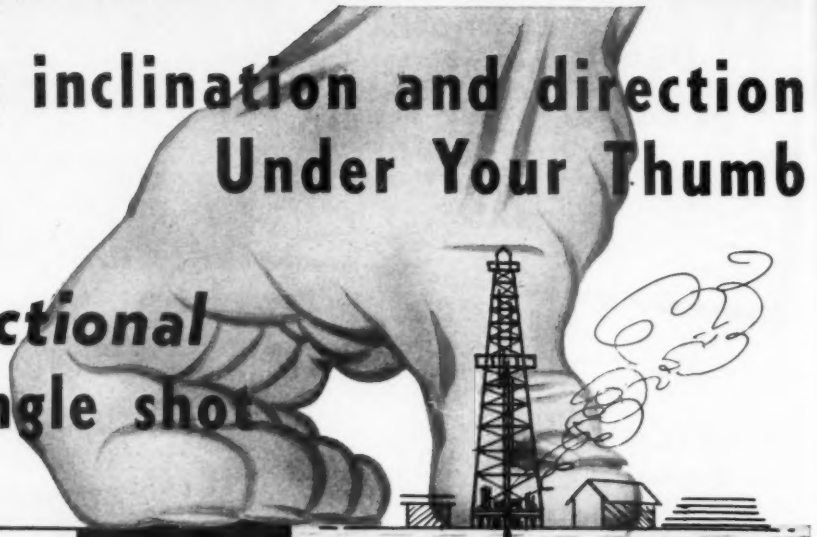


SCHLUMBERGER
WELL SURVEYING CORP.
HOUSTON, TEXAS

XUM

for keeping inclination and direction Under Your Thumb

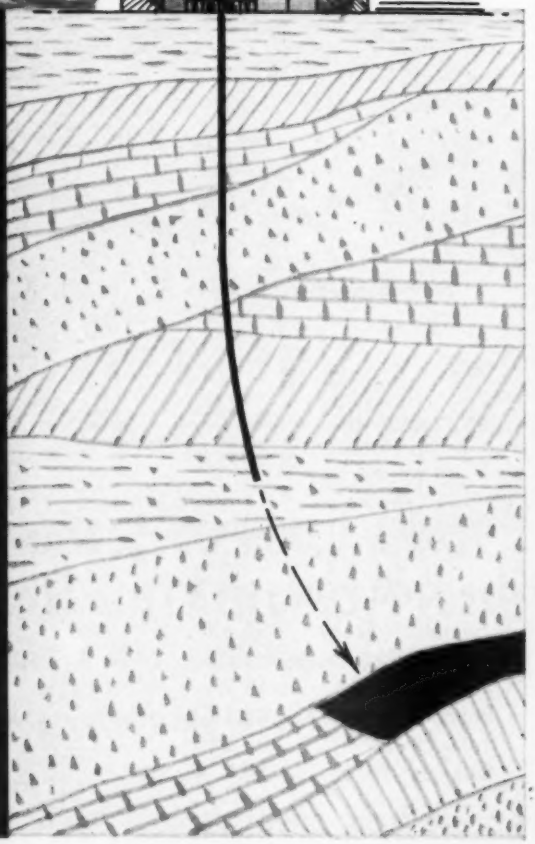
directional magnetic single shot



This new Sperry-Sun survey instrument, available on a rental basis, is used primarily on drilling wells and provides a record of the inclination and direction of uncased wells at any desired depth.

Permanent and extremely accurate records are available within a few minutes after the instrument comes out of the hole . . . *allowing you to keep inclination and direction under your thumb.*

You'll find these other Sperry-Sun services and products invaluable and reasonable: Surwel Underground Surveying Service, E-C Inclinometer, Syfo Clinograph, Non-Magnetic Drill Collar Rentals, and Polar Core Orientation.



SPERRY-SUN WELL SURVEYING COMPANY

3118 BLODGETT AVENUE HOUSTON, TEXAS

Philadelphia, Pa. Falfurrias, Texas Odessa, Texas Marshall, Texas Long Beach, Calif. Oklahoma City, Okla. Lafayette, La. Bakersfield, Calif. Moulden Oil Field Services, Casper, Wyo. Crossville, Illinois

To Serve You Even Better

J. R. "Bob" Meek has devoted nearly two decades as a specialist in pioneering and promotion of sales of Young Cooling Equipment to the petroleum industry.

J. R. Meek, veteran of 16 years' experience with Young heat transfer equipment, succeeds the Happy Company as Young's new exclusive distributor in the Mid-Continent area oil fields. With "Bob" on the job, Young is in better than ever position to serve the oil industry. In the field or at the refinery, Young Units . . . distributed and serviced by the J. R. Meek Co. . . . can provide the economical, safe-and-sure answer to your heat transfer problems. Young Units are specially developed for the equipment they serve. More than twenty years of this specialization for the petroleum industry lie behind every Young product. For proof of Young superiority, you are invited to get in touch with the J. R. Meek Co., Bob Ward Bldg., 1341 So. Boston Street, Tulsa, Oklahoma.

HEAT TRANSFER PRODUCTS FOR AUTOMOTIVE AND INDUSTRIAL APPLICATIONS.

YOUNG

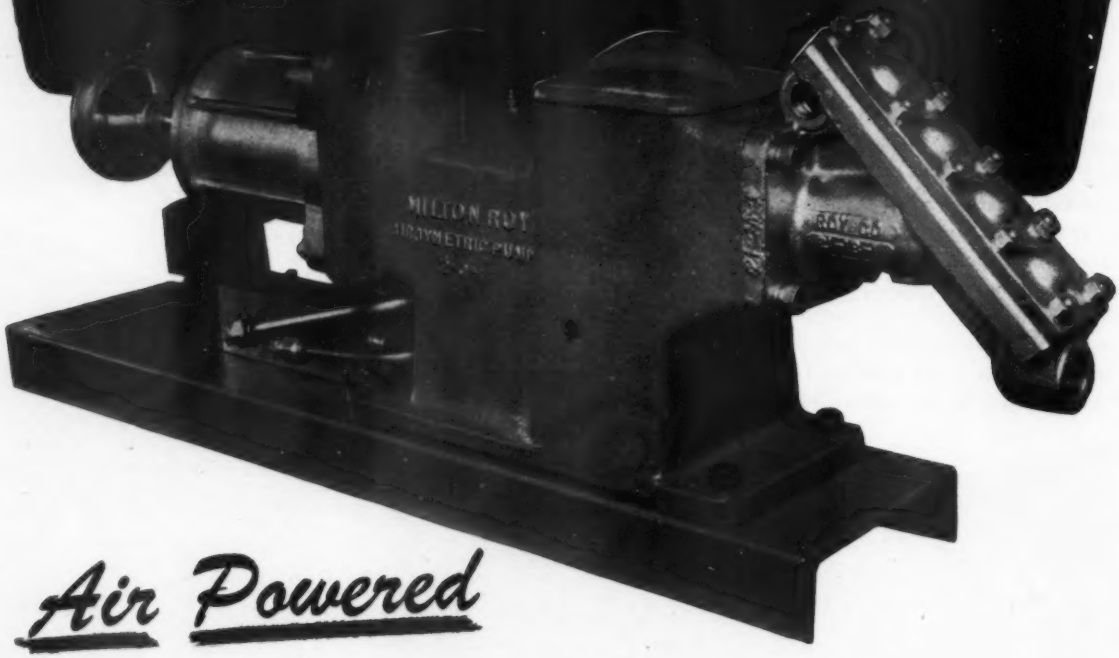
HEATING, COOLING, AND AIR CONDITIONING PRODUCTS FOR HOME AND INDUSTRY.

YOUNG RADIATOR COMPANY, Dept. 200-F, GENERAL OFFICES: RACINE, WISCONSIN
PLANTS AT: RACINE, WIS., AND MATTOON, ILL.

OIL FIELD DISTRIBUTORS: *Mid-Continent Area:* J. R. MEEK CO., 1341 So. Boston St., Tulsa, Oklahoma; *West Coast Area:* FLOURNOY & EVERETT, INC., 5043 Santa Fe Ave., Los Angeles 58, Cal.; *Michigan Area;* H. J. YOUNG, 206 Montgomery Bldg., Muskegon, Michigan.

XUM

"aiRoymetric" Pumps



Air Powered

Milton Roy Controlled Volume Pumping Systems May be Your Answer

With these pumps hydraulic pressures up to 25,000 psi may be obtained and maintained automatically.

You can pump in volumes up to 405 GPH and as little as 2.5 cc per full stroke—and regulate capacity while operating.

As many as a dozen or more liquids can be pumped in precise ratio, one stream to the others.

Chemicals, corrosives, sludges and slurries, solids and fibres in suspension, other "difficult" materials can be pumped.

They are ideal pumps for use where explosion hazards are present—the answer to the Safety Engineer's prayer.

Available are an almost endless variety of low cost pneumatic controls (also manual, mechanical, electrical and electronic controls) with which to engineer completely automatic feed systems.

Milton Roy "aiROYmetric" pumps offer you opportunities for savings that may well amaze you. New Bulletin #450 contains all details, capacity-pressure tables, shows many types of automatic control equipment. Contains also drawings of typical systems for hydrostatic test purposes, blending or formulating, bottle filling, sampling industrial wastes, etc.

Write for Bulletin #450. Ask for recommendations on specific pumping problems.

MILTON Roy COMPANY

WITH THE EXCLUSIVE STEP-VALVE DESIGN

1326 E. MERMAID LANE, CHESTNUT HILL, PHILA. 18, PA.

✓ Check Any Installation and You Will Find

WILSON SUPPLY—INGERSOLL-RAND

"Packaged" Portable COMPRESSORS . . . *Working*

When equipment fails to work in the oil fields—it costs real money. Especially is this true of "Packaged", Portable Compressors.

Wilson Supply - Ingersoll-Rand "Packaged" Portable Compressors are so engineered—both by the manufacturer and Wilson Supply Company—that shutdown time and maintenance costs during the long life of the units are held to a minimum. And if trouble of any kind does develop—*especially trained service men are available for quick action.*

The Wilson Supply - Ingersoll-Rand Compressors have many automatic safety features—features that "Protect" the equipment in event of mishap when attendant is not present.

More and more, the Producing and Pipe Line Industries are finding these "Packaged" Compressors the answer to Gas-Oil lift, Repressuring and Booster problems.

Mounted on heavy skids and completely assembled, these machines are put in operation by merely connecting the suction and discharge lines.

WILSON SUPPLY CO.

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HOUSTON, TEXAS

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TEXAS—Alice, Corpus Christi, Victoria, Bay City, Columbus, Barbers Hill, Liberty, Beaumont, Kilgore, Monahans. LOUISIANA—Lake Charles, New Iberia, Houma, Harvey, Shreveport. ARKANSAS—Magnolia.

SALES OFFICES:

DALLAS — TULSA
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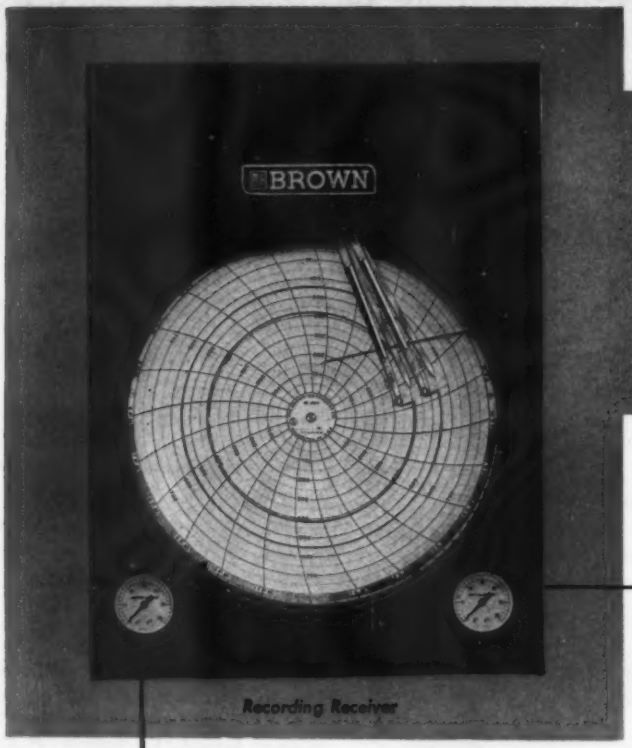
Contact your nearest Wilson Supply Company Store or write "Compressor Division", Wilson Supply Company, P. O. Drawer 19, Houston, Texas, for detailed information, and quotations. Please give suction and discharge pressures and volume to be handled.

ES-1
4¼" x 7"
2¾" x 7"
"Packaged" Portable
Compressor

XUM



Recording Receiver

THESE
Of Brown
ARE INDUSTRY

INSTALLATIONS in the petroleum and chemical industries now run into the thousands . . . each a testimonial to *plus values*, the outstanding features which have made Brown Pneumatic Remote Transmission of process variables the standard of comparison.

A list of the satisfied users of this system would look like a *Who's Who* of industry. And the number of repeat purchases is proof of continuous, long-term performance!

The Non-Bleed Pilot, The Matched Bellows, the high degree of Versatility and the unusual Accessibility have combined to set high standards of safety, convenience and economy in centralized instrumentation for years. Continuing research and engineering will keep Brown Pneumatic Remote Transmission in step with your needs.

Call in your local Honeywell engineer for a discussion of its application in your plant . . . he is as near as your phone! MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4488 Wayne Ave., Philadelphia 44, Pa. Offices in more than 80 cities of the United States, Canada and throughout the world.

Indicating Transmitter

XUM

PLUS VALUES

Pneumatic Remote Transmission

PROVED AND APPROVED!

NON-BLEED PILOT

Special design and construction afford rapid and dependable response . . . keep air consumption low and maintenance at a minimum.

MATCHED BELLOWS

The Bellows and Springs of Transmitter and Receiver are "matched" in calibration . . . the key to the extreme accuracy of the system.

VERSATILITY

Indicating Transmitter can be located where you want it . . . with the Receiver recording up to three variables at a convenient, central point. Control can be from the Transmitter or Receiver.

ACCESSIBILITY

Simplification of all units and components allows ample working room for installation as well as maintenance.

Indicating Transmitter

FOR THE PETROLEUM INDUSTRY

MINNEAPOLIS Honeywell

BROWN INSTRUMENTS

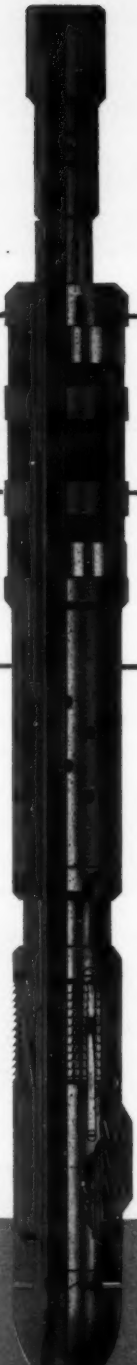
XUM

TIW HOOK WALL PACKERS

NOW! ALL MECHANICAL PARTS PARKERIZED to prevent corrosion

NOW! SLIP MANDRELS CHROME PLATED to prevent sticking and assure easy release

AS ALWAYS! HEAVY DUTY CONSTRUCTION for deep wells and high differential pressures



Shown here are two of a complete line of T-I-W Control Head Packers that have been successfully used on some of the toughest completions ever made.

Features include the automatic bottom pioneered by T-I-W, plus many advanced features that make T-I-W Packers first choice.

T-I-W Packers are available in all-stainless steel construction on special order.

USES INCLUDE: Testing single zone formations • Dual completions • Testing casing or cement jobs • Acidizing • Water injections • Repressuring • Recycling • Perforation washing and improving natural flow.

Left: JSA-C Packer with Hold-Down Slips. This packer can be set repeatedly without coming out of well.

Right: JSA-C Packer without Hold-Down Slips.

PACKERS FOR EVERY PURPOSE

TEXAS IRON WORKS

TIW

Manufacturers of: T.I.W. Portable Rigs . . . T.I.W. Safety Joints . . . T.I.W. Rotary and Casing Slips . . . T.I.W. Grief Stem Safety Valves . . . T.I.W. Packers for every purpose . . . and many other oil field tools.

GENERAL OFFICE and MAIN PLANT: 1401-1423 Maury Street, Houston 10, Texas
Other Shops at Victoria and Corpus Christi
EXPORT REPRESENTATIVE: Val R. Wittich, 30 Rockefeller Plaza, New York, N. Y.

VESSEL DIVISION

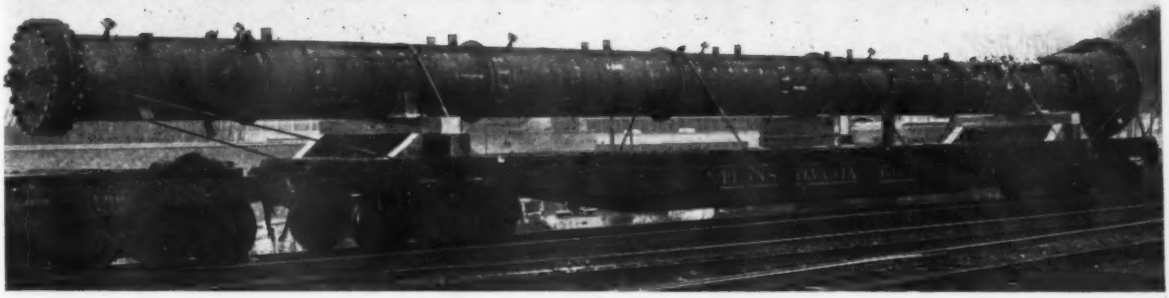
NEWS

A.O. Smith 76th ANNIVERSARY 1874 - 1950

A.O.Smith

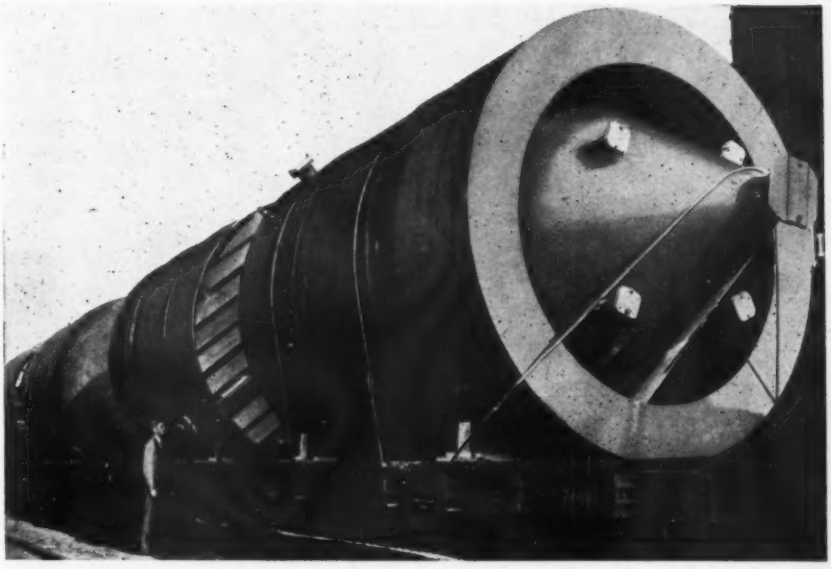
CORPORATION

Atlanta 3 • Boston 16 • Chicago 4 • Dallas 1 • Houston 2
Los Angeles 14 • New York 17 • Philadelphia 3 • Pittsburgh 19
Salt Lake City 1 • Seattle 1 • Tulsa 3 • Washington 6, D.C.
International Division: Milwaukee 1

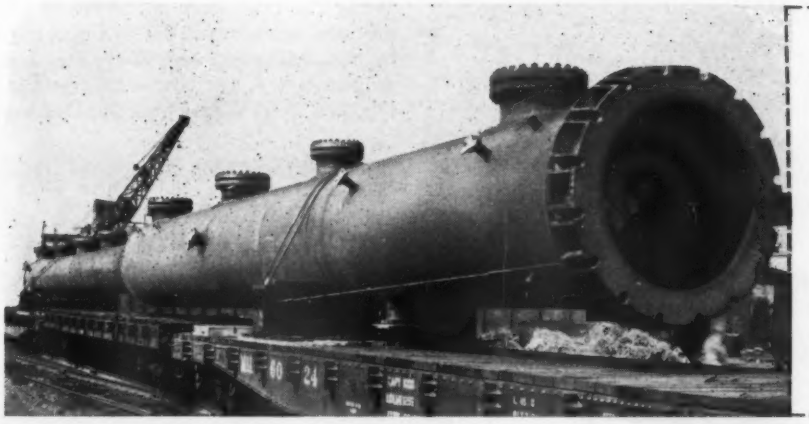


INTO EVERY SMITHlined FAT-SPLITTING TOWER, like the above 68-ft.-long SMITHway Tower, goes the experience and knowledge gained from a long and extensive program of research and development into the corrosion problems of the Fatty Acid Industry.

THREADING A NEEDLE. Getting a 12 ft. dia. by 43 ft. long paper mill replacement digester into an existing building is a difficult feat. A. O. Smith did it by shipping the SMITHlined Digesters *in sections* for final assembly and welding in place inside the paper mill.



A. O. SMITH MAKES ALL TYPES OF OIL-REFINING PRESSURE VESSELS. Here is one type, a SMITHlined Absorber Tower three railroad cars long (approximately 107 ft. long), leaving for a refinery in Ohio.



A. O. Smith Corporation, Dept. OG-650
Milwaukee 1, Wisconsin

Without obligation, send us the latest A. O. Smith Vessel Bulletins:

- ☐ V-44: Field Assembly of Pressure Vessels
- ☐ V-46: Alloy, Alloy-lined, Clad, and Glass-lined Vessels
- ☐ V-52: Multi-Layer Vessel Manufacture and Assembly

Name _____

Firm _____

Street _____

City _____ State _____

XUM

in 1940 this manufacturer was using NEOPRENE in its Gas Lift System... and is still using it today!

"SHE'S GOT NEOPRENE AT EVERY VITAL POINT..."
"Yep, Nixon protected his system top to bottom against packing trouble!"
Story and Pictures Courtesy of
WILSON SUPPLY COMPANY
DU PONT
NEOPRENE
the chemical rubber

here is what Wilson Supply says about NEOPRENE

WILSON SUPPLY COMPANY
OIL AND GAS WELL SUPPLIES
COMPLETE FISHING TOOL SERVICE
NIXON GAS-LIFT

1418 MAURY STREET
Houston 1, Texas.

February 16, 1950

Rubber Chemicals Division
E. I. du Pont de Nemours & Company, Inc.
Wilmington 98, Delaware

Gentlemen:

The Nixon Wire Line Surface Control Gas Lift was introduced to the Industry back in 1937 and was the first successful Surface Control Gas Lift System for lifting oil.

From the very beginning, (and throughout the intervening years), Neoprene has been used for the diaphragms in the control valves of the Intermitter.

The results obtained from this material, even under the most adverse conditions, have been entirely satisfactory. Many of the first Nixon Units, installed some 13 years ago, are still in operation.

Yours very truly,

WILSON SUPPLY COMPANY
International Distributors
of Nixon Products

By _____
PRESIDENT

WDW/aj

In 1940 when we ran the above ad, the Jeddy Nixon Company (now the Wilson Foundry & Machine Company) had already been using neoprene in its Gas Lift System for three years. Nixon used neoprene because it withstands oil, gas and grease.

When you need rubber to meet the most exacting requirements, investigate Du Pont neoprene. Its combination of outstanding properties provides resistance to deterioration from contact with acids, alkalis, oils, grease and most chemicals. And what's more, neoprene withstands exposure to weathering, sunlight, extreme temperatures, abrasion and constant flexing. These and the many other advantages of Du Pont neoprene assure long, trouble-free service life in any product where neoprene is used. Specify it for your equipment needs. While Du Pont does not make any finished products of neoprene, we'll be glad to put you in touch with a supplier. Write to E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division O-6, Wilmington 98, Delaware.

NEOPRENE

The rubber made by Du Pont since 1932

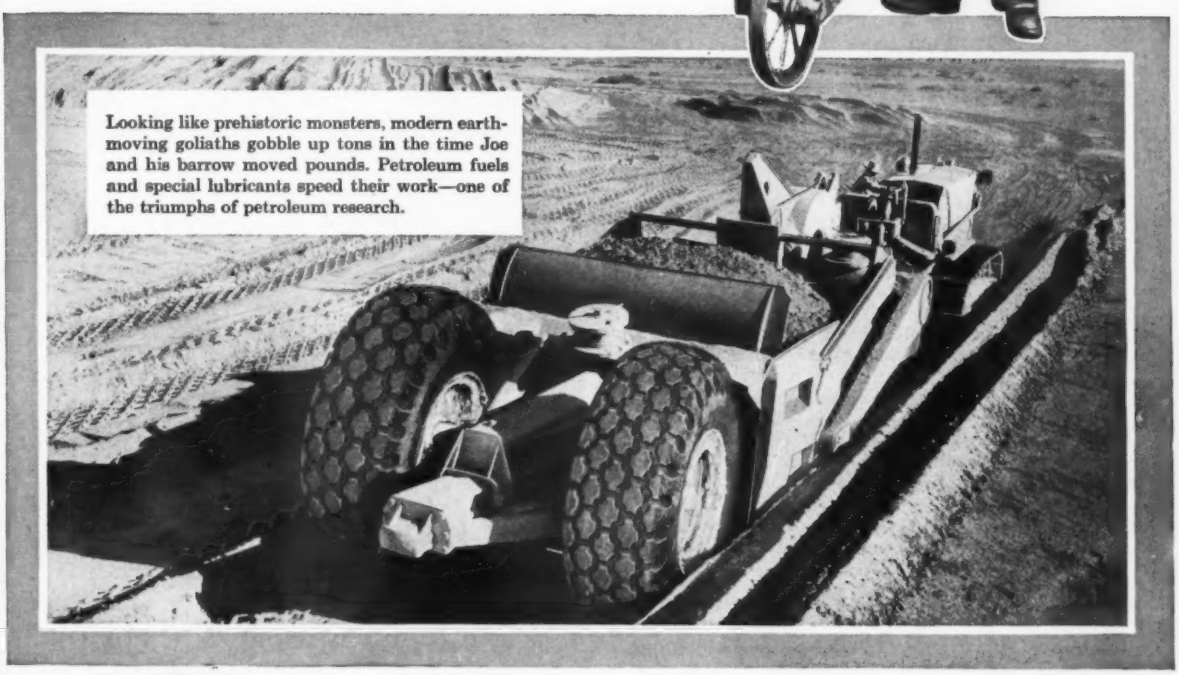
DU PONT

REG. U.S. PAT. OFF.

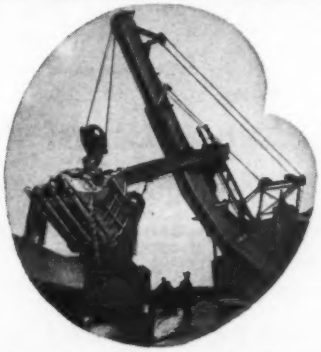
BETTER THINGS FOR BETTER LIVING

Its Grand-Dad was a Wheelbarrow!

How Petroleum Research helps the Engineer Contractor



Looking like prehistoric monsters, modern earth-moving goliaths gobble up tons in the time Joe and his barrow moved pounds. Petroleum fuels and special lubricants speed their work—one of the triumphs of petroleum research.



Digging sand, laying concrete, breaking rock, excavating and construction machines must be lubricated to withstand exposure to heavy strain, shock, dust, mud and abrasives.

Giant power shovels, buckets, scrapers, bulldozers, literally move mountains to span the nation with roads, build dams, levees and foundations. By its research in improving gasoline engine performance, in providing lubricants that helped make the Diesel engine practical and economical, by providing efficient machine lubricants to operate under the severe conditions of mud, water, sand, heavy loads and shock, the petroleum industry has contributed to their achievements—a field in which Texaco has played a vitally important part.

THE TEXAS COMPANY

Petroleum Promotes Progress

TEXACO REG. T.M.

FACTS YOU SHOULD KNOW . . . about

NARROW-BAND 25-50 MC EQUIPMENT

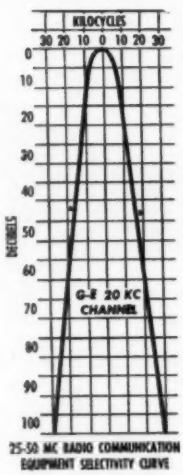
for adjacent channel operation!

● **Minimum Interference**—With adjacent channels now being assigned in the same service area, it's important to remember that G-E narrow-band units reduce interference, yet extend your communication range. They were designed specifically to meet the demand for equipment that would operate on closer spacing than 40 kc.

● **Instantaneous Modulation Limiting**—prevents "clipping" in weak signal areas, assures full utilization of your assigned channel. Limiters in the transmitter provide narrow swing of ± 6 kc deviation, and automatically hold it at this level.

● **Spurious Radiation**—is extremely low, not only in the 25-50 mc band, but throughout the frequency spectrum. Exceeds FCC requirements without external filters.

● **Peak Selectivity**—Triple-tuned transformers mean fewer tubes, lower maintenance, and total standby battery drain of less than 10 amperes. Selectivity is better than 100 db at ± 30 kc.



● You'll want to know more. One of the General Electric offices listed on this page is near you. A wire or a phone call will bring you complete information on G-E radio communication for the petroleum industry.

GET THIS BULLETIN—Bulletin X55-752 is important to every communications engineer. Write for your copy: *General Electric Company, Section 850-25, Electronics Park, Syracuse, New York.*

ATLANTA 3, GA.
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Walnut 9767

BOSTON 1, MASS.
140 Federal Street
Hubbard 2-1800

CHICAGO 54, ILL.
1122 Merchandise Mart
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CINCINNATI 2, OHIO
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Parkway 3431

DALLAS 2, TEXAS
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Prospect 7-4296

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650 17th Street
Keystone 7171

DETROIT 26, MICH.
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CLEVELAND 14, OHIO
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Euclid & Public Square
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Main 2541

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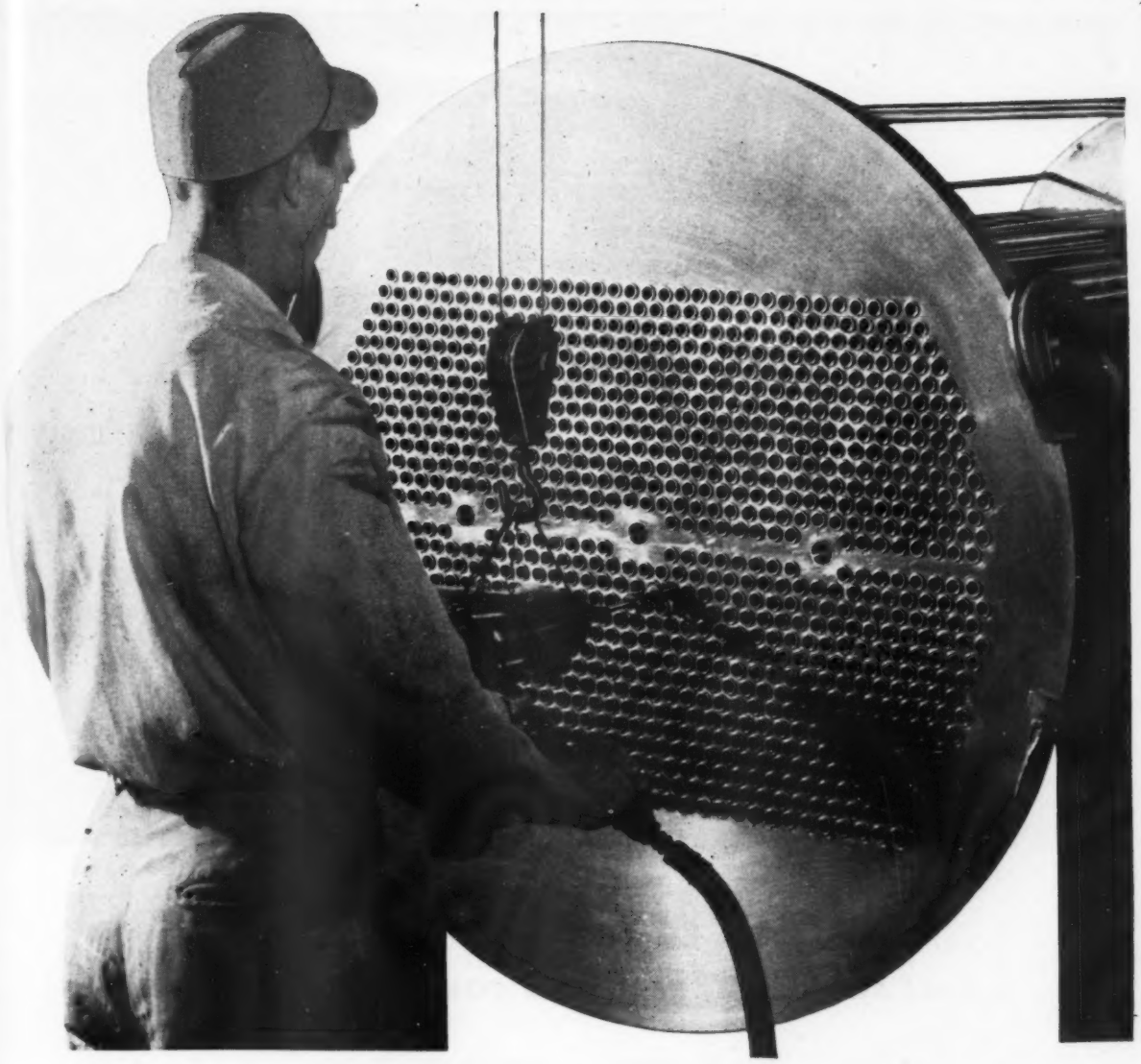
GENERAL ELECTRIC



RETUBING TOO OFTEN? . . . TRY

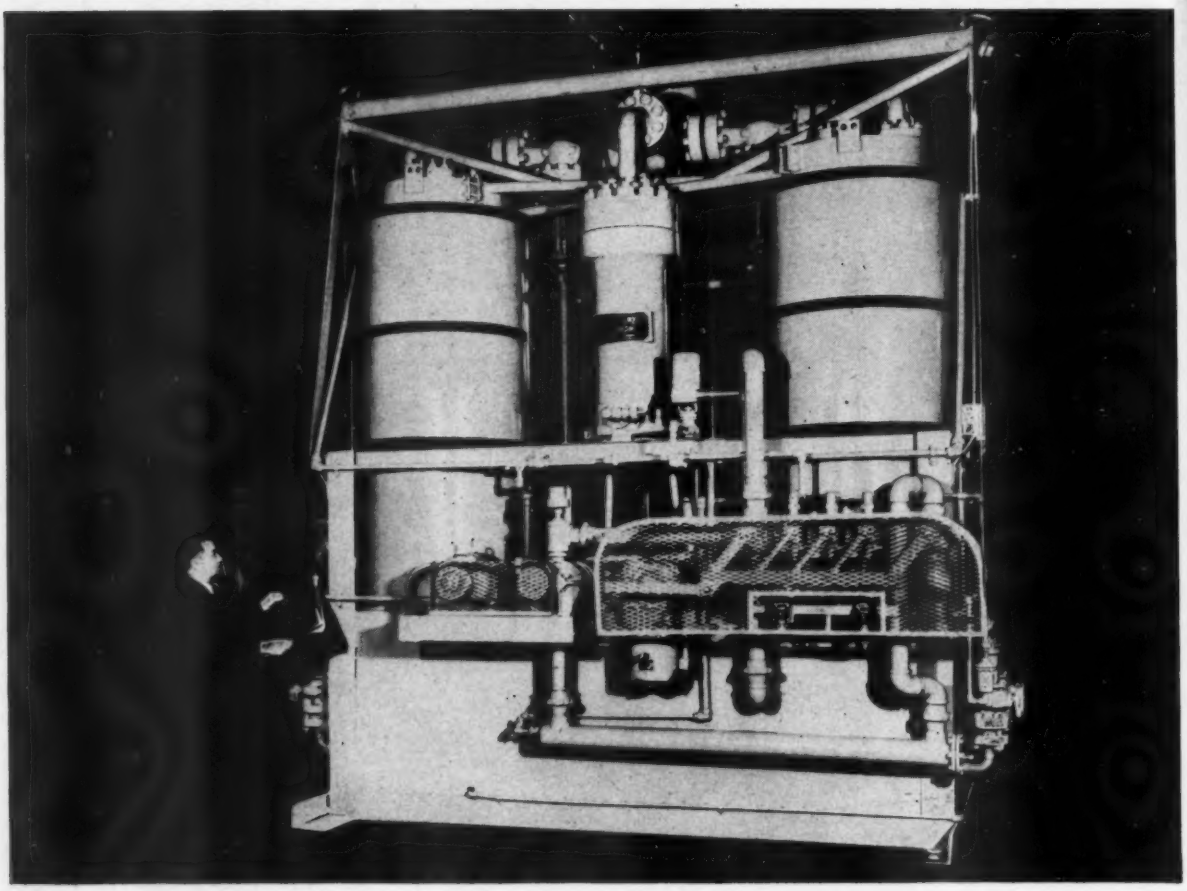
ELECTRUNITE® Stainless Steel Pressure Tubes

Ease of installation . . . long life . . . resistance to high temperatures and extreme corrosion . . . *all* good reasons why it pays to use Electrunite Pressure Tubes made of Republic Enduro Stainless Steel. Full range of analyses to meet every need.

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION • CLEVELAND 8, OHIO
Export Dept.: Chrysler Building, New York 17, N.Y.

REPUBLIC STEEL

Republic
ELECTRUNITE
BOILER, CONDENSER AND HEAT EXCHANGER TUBES



for DRYing at 5,000 psi.

A PACKAGED UNIT, READY TO CONNECT UP AND RUN

You probably work at much lower pressures, but this shows what can be done with Lectrodryers. So big it had to be shipped on a depressed-bottom car, it only needs connecting to feed lines and it's ready for action.

Fully automatic, it reverses the DRYing-regenerating cycle at predetermined intervals. And it will go on doing a safe, efficient DRYing job year after year, with practically no attention. Thousands of Lectrodryers in service all over the world, in every kind of industry, have demonstrated this fact.

Whatever your DRYing problem—air, gases or organic liquids—there's a Lectrodryer for the task. No need for your engineers to take time to design and supervise the building of a special machine. Usually, a standard Lectrodryer can be adapted to your requirements. If not, we'll build the special machine you need.

Write, telling your DRYing problem, to Pittsburgh Lectrodryer Corporation, 325 32nd Street, Pittsburgh 30, Pennsylvania.

In England: Birlec, Limited, Tyburn Road, Erdington, Birmingham.
In Australia: Birlec, Limited, 51 Parramatta Road, Glebe, Sydney.

LECTRODRYERS DRY
WITH ACTIVATED ALUMINAS

LECTRODRYER

REGISTERED TRADEMARK U. S. PAT. OFF.

GET longer wear with R/M NO. 920 the flexible metallic packing

R/M No. 920 is one of several R/M metallic packings that find wide use in oil field, pipeline, and refinery service. It combines long-wearing quality with an anti-frictional surface that preserves rod or shaft. R/M No. 920 is made of asbestos yarns covered with metal foil, a combination that is highly resilient and flexible. Recommended for steam and air rods, centrifugal pump shafts, valve stems, expansion joints, and applications where temperature does not exceed 450°F. and surface speed is not greater than 600 feet per minute.

For full information on R/M No. 920 and the complete line of R/M packings, see your oil field supply store or the authorized R/M packing distributor near you.

RAYBESTOS-MANHATTAN, INC.

PACKING DIVISION, MANHEIM, PA.

FACTORIES: Bridgeport, Conn.; Manheim, Pa.; No. Charleston, S.C.; Passaic, N.J.

RAYBESTOS-MANHATTAN, INC., Manufacturers of Packings • Asbestos Textiles Mechanical Rubber Products • Abrasive and Diamond Wheels • Rubber Covered Equipment • Brake Linings • Brake Blocks • Clutch Facings • Fan Belts Radiator Hose • Powdered Metal Products • Bowling Balls

RM

RAYBESTOS-MANHATTAN, INC.
Packing Division, Manheim, Pa.

Gentlemen: Please send me data on R/M No. 920. C-60

Name_____

Position_____

Company_____

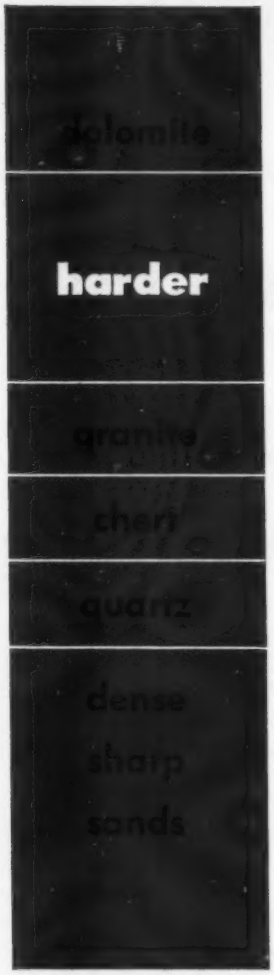
Address_____

City_____ Zone_____ State_____

XUM

for fast drilling in the harder formations

TYPE EH Three Cone Rock Bit



Expressly designed for use in harder formations — dolomite, granite, chert, quartz, dense, sharp sands — the closely-spaced teeth of the CP Type EH Three Cone Rock Bit insure smooth rotation with maximum chipping action.

Reinforced gauge teeth maintain true diameter full gauge hole, and sturdy rolling bearings provide the necessary support for the heavy weights required to drill the harder formations.

Cones are set at proper angle for most effective rolling and crushing action, with a minimum of sliding — permitting longer hours in hole before the bit dulls.

CP bits are designed in the necessary types and sizes to meet the specific drilling requirements in different oil fields. Prompt service is assured in the Mid-Continent and Rocky Mountain fields.

CHICAGO PNEUMATIC
TOOL COMPANY

MANUFACTURED AT FRANKLIN, PA.

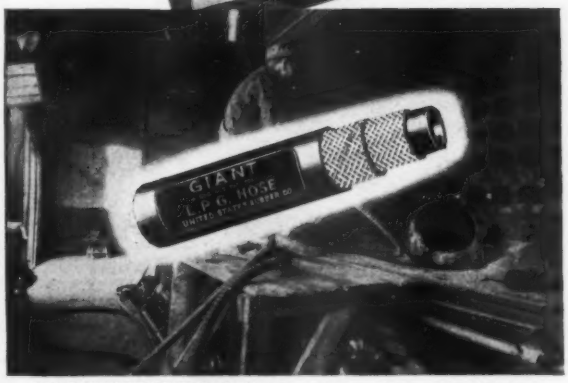
GENERAL & EXPORT OFFICES: 6 EAST 44th STREET, NEW YORK 17, N. Y.

Oil Tool Sales Office: One N. W. 16th Street, Oklahoma City, Oklahoma

3 ROUGHNECKS FOR THE OIL REFINERY

Just a few of the dozens of U. S. Rubber Hose that keep production moving in a cost-conscious business

FOR FIRE PROTECTION in refineries, chemical and acid plants, use "U. S." Matchless Carbolized Fire Hose. It is also widely used for street cleaning, sewer flushing, paving and other services. The tough tube, the cover and the capped ends protect the carcass from the action of oils, acids, mildew and rot. Withstands 400 pounds test pressure. Black or white neoprene cover protects against sun checking.



FOR CONDUCTING STEAM OR AIR to operate a cleaner in cleaning interiors of still tubes in oil refineries, use "U. S." Amazon Still Cleaning Hose. This is the most economical hose where tubes are cleaned when fairly hot, and external heat is a factor. Oil-resistant tube and cover. For air pressures averaging 100 to 125 pounds.

WHEN YOU'RE HANDLING saturated steam pressures up to 200 pounds, pick "U. S." Matchless Steam hose, because *it cannot burst.* If after long service, steam finally penetrates the inner lining of Matchless, the steam merely seeps through the cover, which has become porous, indicating that a replacement should be made.

Bring your problems about hose to the research and design staff of United States Rubber Company. They can show you how to make the best selection, how you can lower your operating costs, increase production. Write to:

A PRODUCT OF

U.S.RUBBER
SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Cutler-Hammer TNY

the Valve Operator with Thrust Controlled Seating

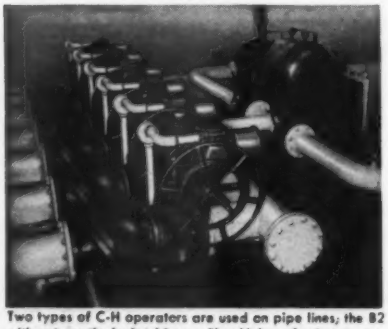
that assures absolutely safe, accurate and consistent seating

The principle of the unique Thrust Controlled Seating of C-H TNY operators

During seating movement, Fulcrum is at A (above) and drive is down, toward the valve seat. At moment of tight seating, Fulcrum transfers to B (below) and further drive is upward, against the springs, which trip the *THRUST* switch and absorb the drift energy of the motor.

As every practical operating man knows, the problem of *mechanized* valve operation is the problem of seating the valve to the required degree of tightness without undue strain upon any of the valve parts —in the face of conditions that vary widely not only from installation to installation but from time to time on the same valve.

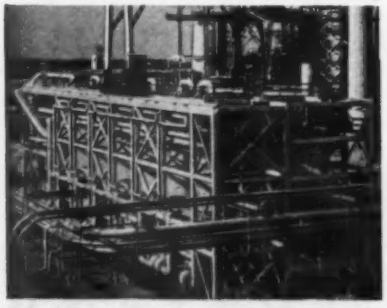
There is one system of valve operation that *does* seat valves accurately, safely, without need of manual seating or back-off, without danger of jamming . . . the Cutler-Hammer TNY Valve Operator with *THRUST* controlled seating. With this unique feature, the motor *positively* drives the valve disc home. During the driving period, the "fulcrum" is established at the yoke nut by heavy steel springs which exactly balance *tight seat pressure*. Therefore, *at the exact instant of desired tight seating, the driving fulcrum transfers to the seat of the valve,* hence any further drive is into the heavy springs themselves which trip the *THRUST* switch and harmlessly absorb motor drift. The amazing thing is, the same degree of tight seating is maintained as valve parts expand and contract. No other valve operator has this direct *THRUST* controlled feature. No other valve operator can be as safe and sure and accurate. You can get C-H TNY as standard equipment on all leading makes of valves. CUTLER-HAMMER, Inc., 1453 St. Paul Ave., Milwaukee 1, Wis.



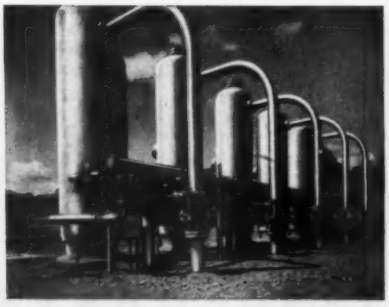
Two types of C-H operators are used on pipe lines; the B2 with **automatic declutching** on Plug Valves, for instantaneous stop, and the TNY on Gate Valves for thrust seating.

Best by test through many years for every petroleum industry need

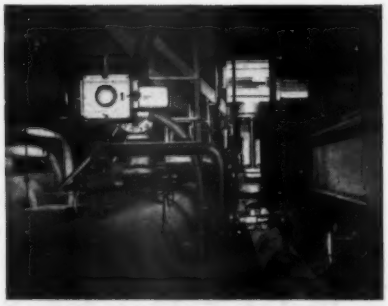
CUTLER-HAMMER
VALVE CONTROL
C-H



Cutler-Hammer electric valve operator experience in petroleum refining spans the entire decade since advanced processes brought the first units into use.



From the earliest of gas handling installations to the newest of the underground storage jobs, leading engineers have selected C-H Electric Valve Operators.



For more than 40 years C-H Valve Operators have been the overwhelming choice of power plant and waterworks engineers.

Check The Many Ways—

The start of any field laboratory investigation begins with receipt of samples for study.

Du Pont Field Laboratories

Can Help You...

CONSULTATION ON TECHNICAL PROBLEMS

To assist in the use of Du Pont TEL Compounds and other additives, Du Pont maintains five field laboratories, each conveniently located in a major refining area to work more closely with you. These are staffed with technical personnel qualified to consult with you and your laboratory personnel on any problem involving the use of additives. This service also extends to assistance on refinery problems such as those involving treating, processing, and others.

HELPFUL TESTS

The tests which are being conducted daily in the field laboratories—for octane number determination, lead content, volatility, storage stability and the like—are generally standard inspection tests . . . but often go far beyond that in results. For example, a tetraethyl lead blending study recently conducted for one refinery demonstrated that a range of over $3000 a day in realization existed among the several schedules under consideration.

FACILITIES FOR EMERGENCY HELP

In addition to handling any regular inspection or antiknock tests, the Du Pont field laboratories can be called on in an emergency to handle refinery control work, check your own laboratory results as well as to conduct special investigations.

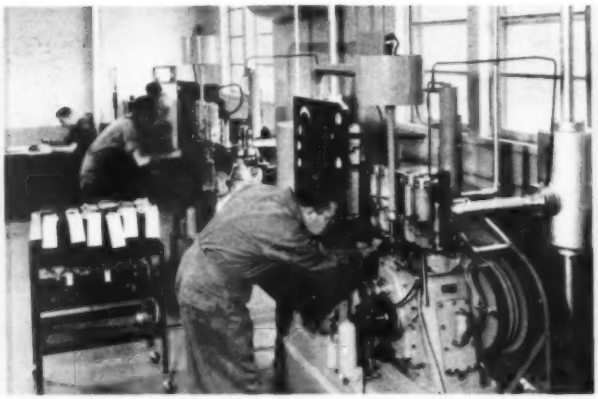
DU PONT

BETTER THINGS FOR BETTER LIVING
. . THROUGH CHEMISTRY

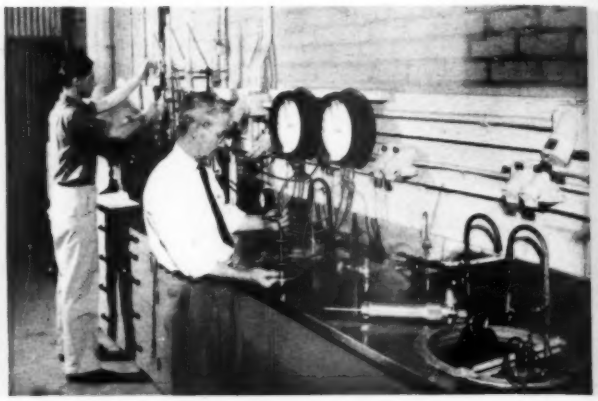
USE DU PONT TETRAETHYL LEAD COMPOUNDS

Du Pont Field Laboratories

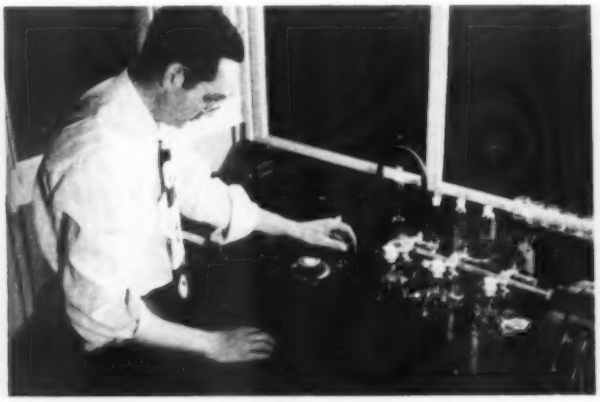
Aid in the Economical Production of Better Fuels



OCTANE RATING AND TEL REQUIREMENT TESTS—Of major help to you in evaluating your fuels and your TEL needs, as well as in checking your own laboratory findings, this service of the field laboratories is also utilized on a nation-wide basis to secure the comprehensive data for the Du Pont Quarterly Motor Gasoline Survey.



ANTIOXIDANT EVALUATION—Determination of a gasoline's antioxidant needs, in terms of the three Du Pont Gasoline Antioxidants Nos. 5, 6 and 22, is another service of the field laboratories. In a number of cases the recommendation of the laboratories has resulted in significant savings in antioxidant costs.



ECONOMICAL COPPER CONTROL—Du Pont field laboratories are equipped to analyze your gasoline for the presence of copper even when only traces are present, and make recommendations for its effective control with Du Pont Metal Deactivator. The use of this additive, as recommended by field laboratories, has helped a number of refiners materially to lower their antioxidant treating costs.

DYE RECOMMENDATIONS—Because Du Pont is the producer of a complete line of gasoline dyes, all field laboratories are prepared to help you select an identifying color for your gasoline. Newest of the Du Pont Gasoline Dyes is Du Pont Oil Blue A, a dye of high tinctorial strength, improved solubility, and meeting MIL-F-5572 Specifications for aviation gasolines intended for military use.

DID YOU KNOW . . . that Du Pont developed and manufactures neoprene, the useful chemical rubber which resists oil, chemicals, sunlight, weather and heat? That is why you'll find in the new cars about 30 vital parts giving improved performance because they are made of neoprene, only one of the many Du Pont products finding use throughout the petroleum and automotive industries.

MAKE DU PONT THE SOURCE FOR ALL OF YOUR GASOLINE ADDITIVES . . .

- **TETRAETHYL LEAD COMPOUNDS** *(Motor Mix—Aviation Mix)*
- **ANTIOXIDANTS**
- **METAL DEACTIVATOR**
- **DYES**

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . THROUGH CHEMISTRY

E. I. DU PONT DE NEMOURS & COMPANY (INC.)
Petroleum Chemicals Division · Wilmington 98, Delaware

District Laboratories: Wilmington, Del. • Chicago, Ill. • Tulsa, Okla. • Houston, Texas • El Monte, Calif.

District Offices: New York, N. Y. • Chicago, Ill. • Tulsa, Okla. • Houston, Texas • Los Angeles, Calif.

A-391

To Meet All Your Tank Venting Needs . . . "Varec"

Offers The Most Complete Line Of

CONSERVATION VENT VALVES AND UNITS FOR EVERY TANK VENTING PROBLEM

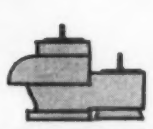


FIG. No. 2000

FIG. No. 5800

FIG. No. 2000-C

FIG. No. 5800-C

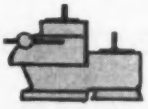


FIG. No. 2000-A

FIG. No. 5800-A

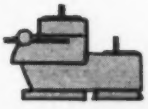


FIG. No. 2000-CA

FIG. No. 5800-CA

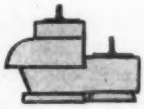


FIG. No. 2000-S

FIG. No. 5800-S

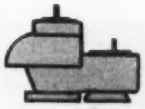


FIG. No. 2000-SC

FIG. No. 5800-SC

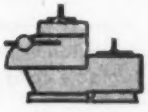


FIG. No. 2000-SA

FIG. No. 5800-SA

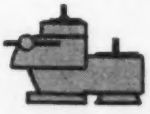


FIG. No. 2000-SCA

FIG. No. 5800-SCA

FIG. No. 20

FIG. No. 58

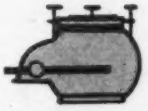


FIG. No. 20-A

FIG. No. 58-A

FIG. No. 22

FIG. No. 59

FIG. No. 22-A

FIG. No. 59

Write For Bulletin CP-2000

PROVED and APPROVED Varec

THE VAPOR RECOVERY SYSTEMS CO.
COMPTON, CALIFORNIA, U.S.A.

Cable Address: VAREC COMPTON USA (All Codes)

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TANK GAUGES • SWING LINE EQUIPMENT • VAPOR RECOVERY REGULATORS • INTERNAL SAFETY VALVES AND OTHER TANK ACCESSORIES

150 MILLION B.T.U.'s LIBERATION PER HOUR

30 NATIONAL AIROIL TANDEM COMBUSTION UNITS

Alcorn double end-fired crude oil heater in a new Ohio refinery.

These thirty N.A.B. gas-oil fuel TANDEM COMBUSTION UNITS were chosen to successfully obtain a uniform heat apportionment between floor and roof radiant tubes.

Consult with us on your particular installation or problem . . . we'll gladly comply with full information.

NATIONAL AIROIL BURNER CO., INC. NAB

Main Offices & Factory: 1236 EAST SEDGLEY AVENUE
PHILADELPHIA 34, PA.

SOUTHWESTERN DIVISION: 2512 SOUTH BOULEVARD
HOUSTON 6, TEXAS

NEW!

ANOTHER Wilson FIRST!

Wilson TORCAIR-ROADAIR GIANT RIGS

The New Wilson Torcair or Roadair Rig — is the First Rig designed specifically to be used either with Torque Converters or Direct Engine Drive! Can be purchased as a Direct Driven Rig (without torque converters) and converters can be added at any time later, with no changes in rig or drive system. Or can be purchased with torque converters, and if desired torque converter can be removed and converted to direct engine drive.

Completely New, from front to rear. Incorporates all the latest and most improved features to be found in any drilling rig, and many new features exclusive to Wilson. *The First All New Post War Rig by any maker that was building power rigs before the War!*

Available with *chain driven rotary table, or universal shaft driven table, or with independent table drive unit.* The latter unit available either *with or without cathead shaft.*

Available with engine radiators conventionally mounted in front of engines, OR with radiators mounted over engines and a bevel gear and V-Belt drive to fans to blow air upwards. This will save about 14" in length of engine unit.

The WILSON GIANT TORCAIR-ROADAIR RIG *can be transported in one unit, or can be broken down into several smaller units where road laws require lesser weights, or lesser widths. The rig that can be moved at minimum cost under any road condition! It is the only rig with four air clutch speeds on the Drum, that can be changed while running, and under load, if desired.*

5 STAR FEATURES—Exclusive to Wilson!

THE ONLY RIG . . .

1. **Designed to operate either with or without torque converters.**
2. **With Four Friction Clutch Speeds on the Drum.**
3. **Equipped with Air Tube Disc Clutches, on all Drives. The World's best clutch!**
4. **With Box type compound that is split into sections, one for each engine.**
5. **That has no Flexible Coupling between engine and compound and needs none. (All Flexible couplings are a source of great trouble on drilling rigs).**

SEE YOUR NEAREST WILSON DISTRIBUTOR or WRITE FOR BULLETIN 180

Wilson MANUFACTURING CO., Inc.
WICHITA FALLS, TEXAS

XUM

PIPELINE OFFICIALS GATHER TO SEE REVOLUTIONARY NEW ANGLE GAS ENGINE COMPRESSOR

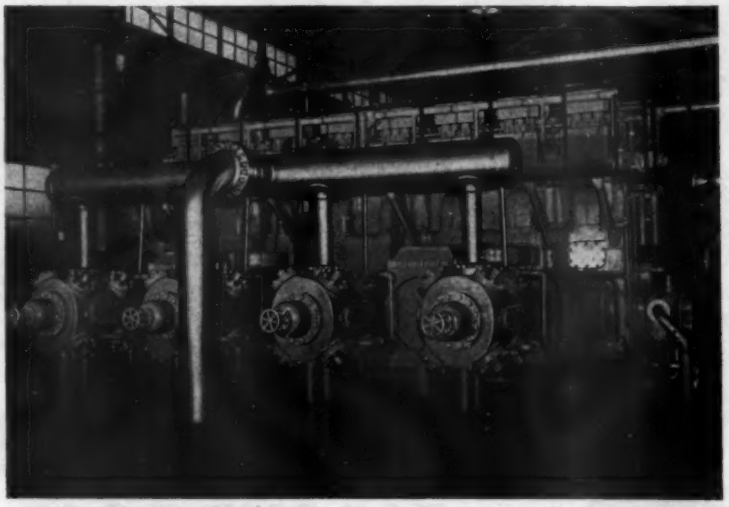
Tennessee Gas Transmission Company's New Worthington Uniflo TYPE UTC-16 Draws Visitors From Near And Far

So widespread was the interest in Worthington's new Angle Gas Engine Compressor, TYPE UTC-16, that engineers and other executives from transmission companies all over the country came to see the first of these units in actual service — at the Tennessee Gas Transmission Company's Monroe, La., plant.

Advance notices of outstanding performance were fully lived up to, observers being particularly enthusiastic over the new uniflo scavenging. This radical improvement over conventional loop design provides more than double the port area and 50% more exhaust area. Straight-line air flow thoroughly cleanses and cools the entire cylinder, and timed valves retain greater weight of pure air for perfect combustion and stepped-up supercharging.

Features For Top Performance

En bloc frame, with removable cylinder liners . . . double air manifolds . . . completely symmetrical outer piston walls, wrist-pin in separate carrier . . . cone-type cylinder head, with streamlined passages and two large exhaust valves . gear driven camshafts for positive drive and perfect timing . . . positive pressure lubrication through cast-in manifolds to all moving parts . . . large access doors on both sides of frame for complete accessibility . . . Worthington Feather* Valves, most efficient ever made, in all cylinders.



The Tennessee Gas Transmission Company's new Worthington Angle Gas Engine Compressor — uniflo TYPE UTC-16 — installed at Monroe, La. The Company's natural gas pipeline will reach Buffalo, N. Y., and further extension is planned.

Wide Usefulness

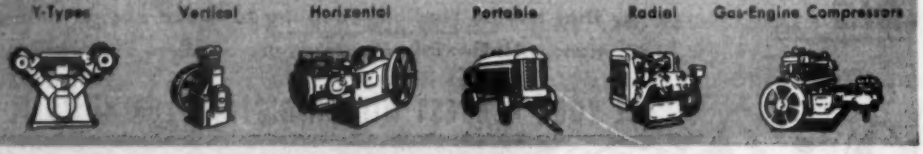
On pipeline duty, in refinery service— in fact, wherever gas must be compressed and suitable gas fuel is available — the uniflo TYPE UTC-16 offers dependability and economy never before possible . . . proof that, as always, *there's more worth in Worthington.* Learn more about this outstanding advancement in angle gas engine compressors. Contact your nearest Worthington Branch Office or the *Worthington Pump and Machinery Corporation, Engine Division, Buffalo, N. Y.*

WORTHINGTON

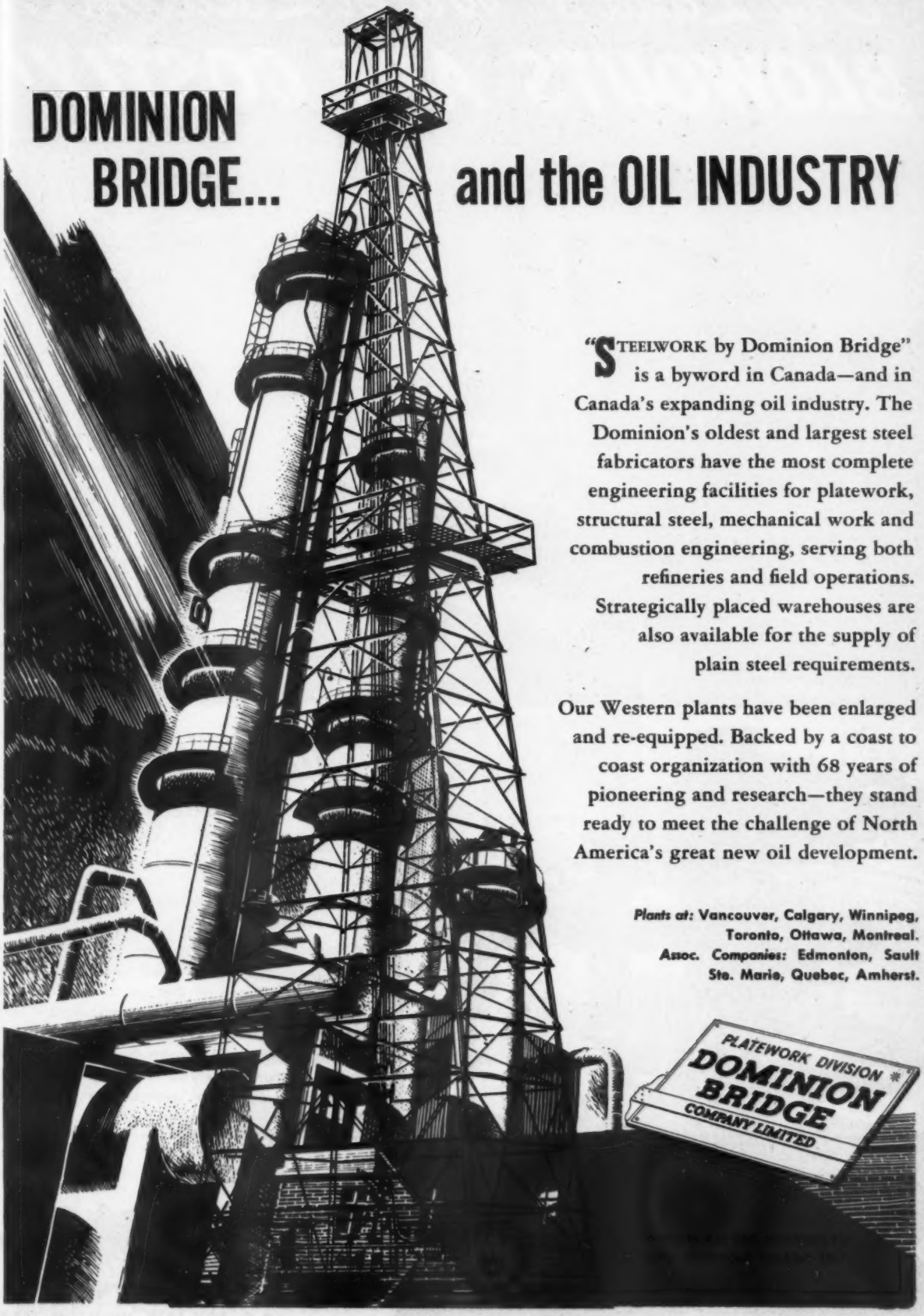
*Reg. U. S. Pat. Off.

EK-6-2

NO OTHER COMPRESSOR WILL OUTPERFORM A WORTHINGTON



DOMINION BRIDGE... and the OIL INDUSTRY



"STEELWORK by Dominion Bridge" is a byword in Canada—and in Canada's expanding oil industry. The Dominion's oldest and largest steel fabricators have the most complete engineering facilities for platework, structural steel, mechanical work and combustion engineering, serving both refineries and field operations. Strategically placed warehouses are also available for the supply of plain steel requirements.

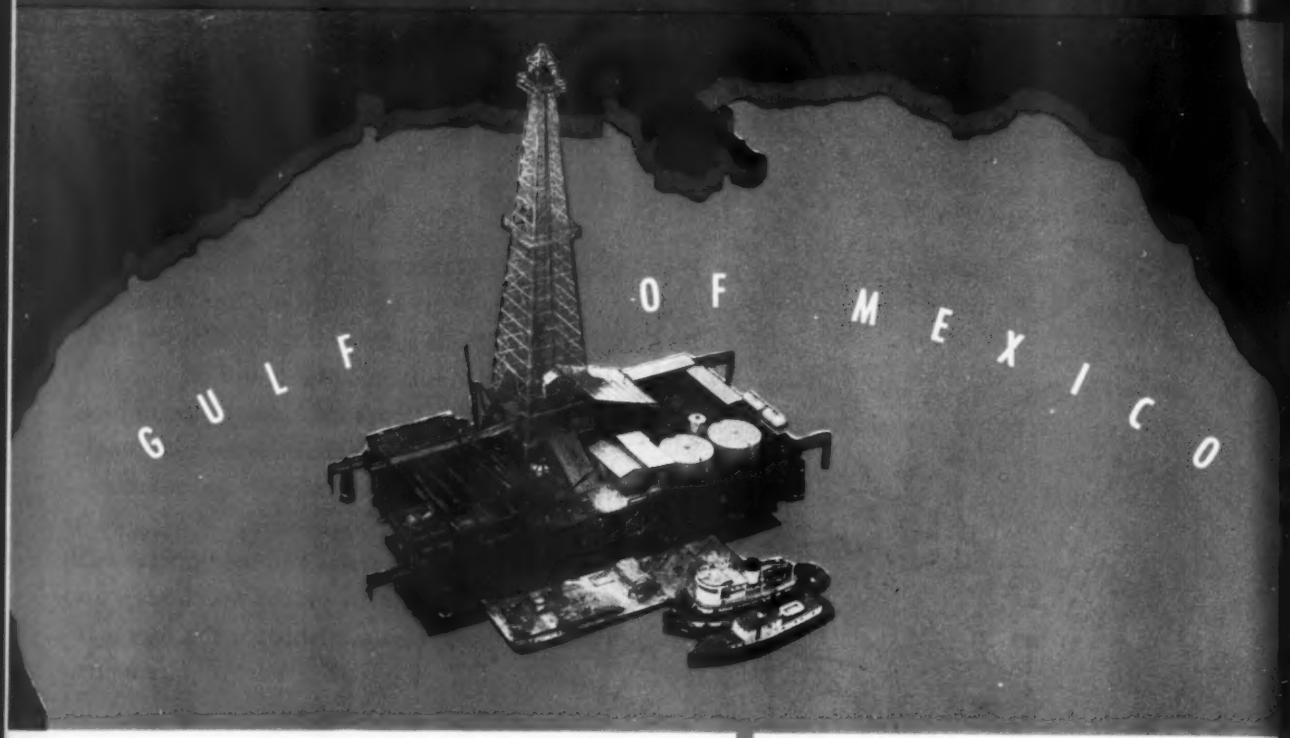
Our Western plants have been enlarged and re-equipped. Backed by a coast to coast organization with 68 years of pioneering and research—they stand ready to meet the challenge of North America's great new oil development.

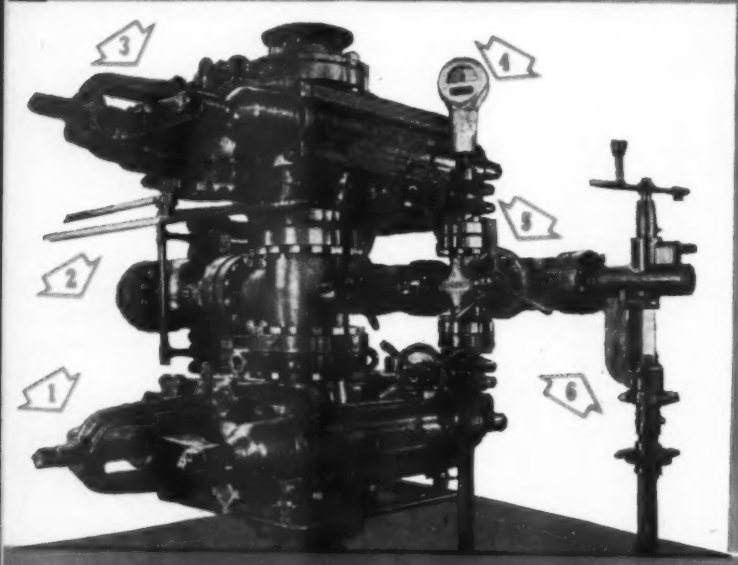
Plants at: Vancouver, Calgary, Winnipeg, Toronto, Ottawa, Montreal.
Assoc. Companies: Edmonton, Sault Ste. Marie, Quebec, Amherst.

PLATEWORK DIVISION
DOMINION BRIDGE
COMPANY LIMITED

XUM

Dry Land or Water Location . . .
BLOWOUTS ARE COSTLY!





1 Cameron Type "QRC" Pressure-Operated Blowout Preventer, equipped with blind rams. 2 Cameron Type "HCR" Pressure-Operated Flowline Gate Valve. 3 Cameron Type "QRC" Pressure-Operated Blowout Preventer, equipped with pipe rams. 4 Cameron Mud Line Pressure Gauge. 5 Cameron Flex-Seal Mud Line Valves in mud choke manifold. 6 Cameron Type "D" Flow Wing in mud choke manifold.

Minimize Risk . . .

WITH THESE PROVEN CAMERON DRILLING CONTROL UNITS

In any high pressure area, such as the Texas-Louisiana Gulf Coast, it is imperative that drilling wells be protected against blowouts with the best equipment available.

Cameron Type "QRC" Pressure-Operated Blowout Preventers, Type "HCR" Flow Line Gate Valves, and other safeguards that go to make up the modern basic drilling control assembly (left), are the industry's most positive mechanical insurance against blowouts. As hazards increase, such as on water locations, safety-conscious operators augment the basic control assembly with additional Cameron units of protection.

Cameron

IRON WORKS, INC.

P. O. BOX 1212 HOUSTON, TEXAS

Export: 74 Trinity Place, New York, N. Y.

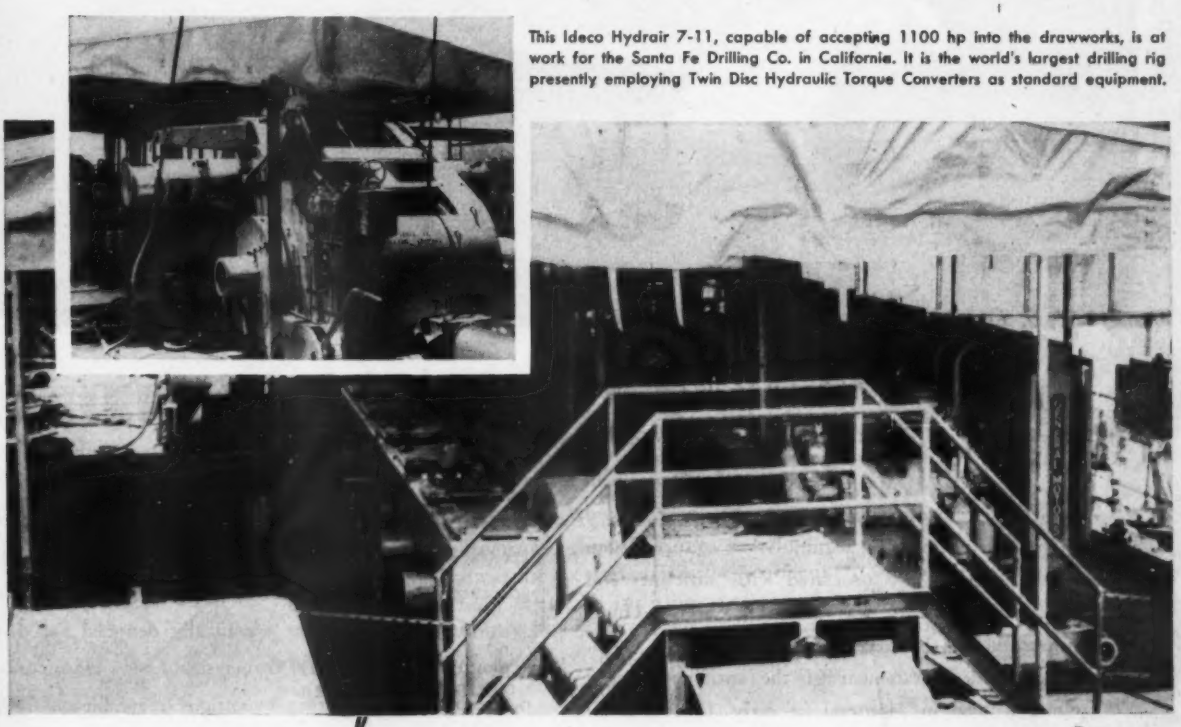
Standard on the *Big* Rigs

On this big new Ideco Hydrair 7-11 drilling rig, designed to go 11,000 feet, power is transmitted from the three twin GM Diesel engines to the compound through Twin Disc Torque Converters.

This fluid transmission absorbs every shock load. It eliminates all gear shift guesswork within the high-speed and low-speed range because it automatically adjusts output speed ratios to meet changing load requirements.

Capable of multiplying engine torque more than five times at stall, the Twin Disc Torque Converter gives maximum speed for raising the empty block . . . maximum pull for coming out of the hole—without throttling or shifting gears.

Just as Twin Disc Torque Converters are becoming standard on smaller rigs, so, too, are these three-stage converters becoming standard on the deep-well rigs . . . because records prove that with them you can drill more hole faster, with less wear and tear on the equipment, at lower cost. Twin Disc Hydraulic Torque Converters (Lysholm-Smith type) are available in capacities from 40 hp to 1,000 hp. For complete information, write today for Bulletin No. 135-C.



This Ideco Hydrair 7-11, capable of accepting 1100 hp into the drawworks, is at work for the Santa Fe Drilling Co. in California. It is the world's largest drilling rig presently employing Twin Disc Hydraulic Torque Converters as standard equipment.

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

Clutches & Hydraulic Drives

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

BRANCH OFFICES: CLEVELAND • DALLAS • LOS ANGELES • NEWARK • NEW ORLEANS • SEATTLE • TULSA

XUM

CHAPTER TWO in the Fascinating Story of the Search for Oil

In 1861 Soon after the Drake well was completed, geologists began to speculate with regard to conditions governing the accumulation of petroleum. Oil and gas deposits were associated with anticlines and thus the anticlinal theory was born. T. Sterry Hunt, then chemist on the First Geological Survey of Canada, made the first clear statement of the anticlinal theory in a public lecture in Montreal in early 1861. These writings present a comprehensive and workable theory of petroleum origin which differ but little from some present-day theories. From E. DeGolyer's book, *"The Development of the Art of Prospecting."*

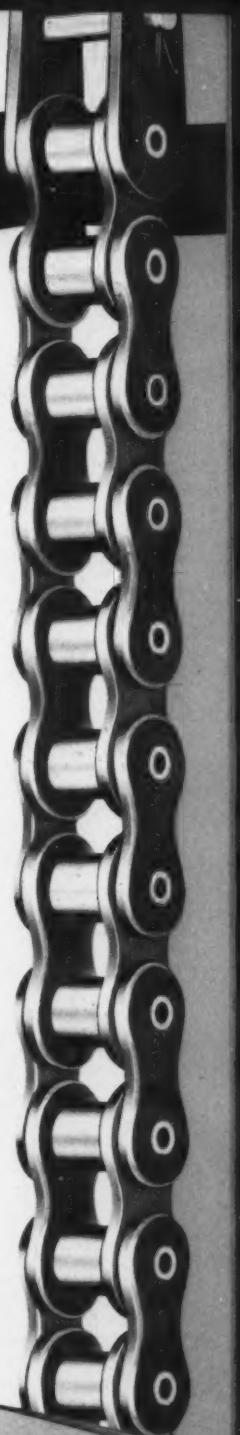
In 1950 Characteristic today of the progress that has been made since Hunt's anticlinal theory are the General Geophysical Crews who are now compiling accurate data far in advance of today's deepest production. Working with equipment specifically designed for deeper exploration, these General Geophysical Crews are accurately determining and locating conditions favorable to finding new oil reserves. For more than a decade operators have relied on General's experienced crews to lead the way to their next discovery well. And today, General is better equipped than ever.

General
GEOPHYSICAL COMPANY
GULF BLDG. HOUSTON

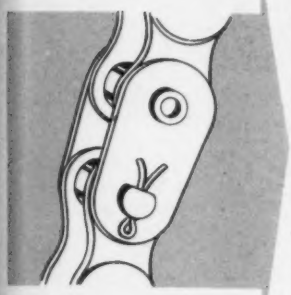
A PRINT OF THIS ILLUSTRATION SUITABLE FOR FRAMING WILL BE SENT ON REQUEST

Easy does it...

with the NEW "BA" Riveted Oil Field Roller Chains



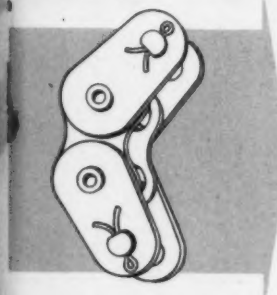
EASY TO TAKE APART



The radically different single pin connector link of "BA" . . . Baldwin Assembly . . . Riveted Oil Field Roller Chain makes it easy to take apart or assemble the chain. Readily distinguished by their "teardrop" shape, two single pin connectors are located in each 5 feet of chain.

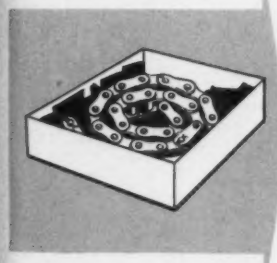
One end of the special pin is spun over a washer . . . the other has a milled flat which fits into a special hole in the connector plate and is secured by a cotter. The pin is a slip fit through the link except for the milled flat end. Thus, it is easy to drive out the pin without damaging chain parts.

EASY TO REPAIR AND ADJUST



In addition to the ease of assembly and disassembly, "BA" Chains make adjustment and repair easy. A 3-pitch repair unit consisting of a standard roller link and two single pin connector links is easy to couple into a chain strand. Since most repair jobs require the trimming out of at least one pin link and one roller link, the 3-pitch repair unit offers the most convenient way to couple the chain strand. BUY THEM NOW. Keep a standard repair link on hand for every roller chain drive on your rig. Interchangeable with any standard roller chain.

EASIER, FASTER SERVICE



The "BA" Assembly is shipped in boxes in standard 5-foot lengths. Each basic length has 2 single pin connectors. Thus, it's easy for your supply store to *build up* from the basic lengths, plus standard smaller assembly sections, the *exact* length of chain required. There is no need to cut the riveted chain with consequent damage to press fits and chain parts. In addition, it is recommended that offset links be assembled at 5-foot intervals following the single pin connector links. These offsets can be removed easily to compensate for normal chain elongation.

With "BA" Assembly, you get the longer life and lower cost of riveted roller chain plus amazingly easy assembly and disassembly.

For all the facts on the "BA" Assembly, Rex A.P.I. Chains and Rex Oil Field pumps, see your local supply store or write for your copies of Bulletins 49-29 and 47-12. Chain Belt Company, 1619 West Bruce Street, Milwaukee 4, Wis.

BALDWIN·REX

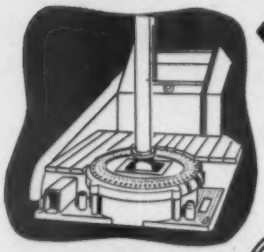
ROLLER CHAINS

a complete line from ¼-inch to 2½-inch pitch

PRINTED IN U.S.A.

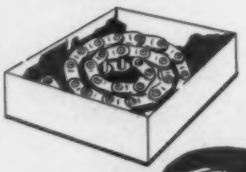
REX OFFSET SIDE BAR ROLLER CHAINS

for the Tough, Dirty Drilling Jobs

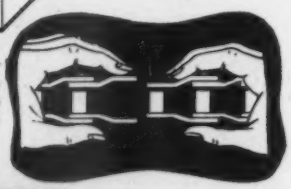


Rex Offset Side Bar Roller Chains can accommodate minor misalignments . . . operate efficiently in dusty, dirty locations.

Rex Offset Side Bar Roller Chains have highly finished parts, held to close tolerances.



Rex Offset Side Bar Roller Chains are stocked in boxes in convenient 10-foot lengths.

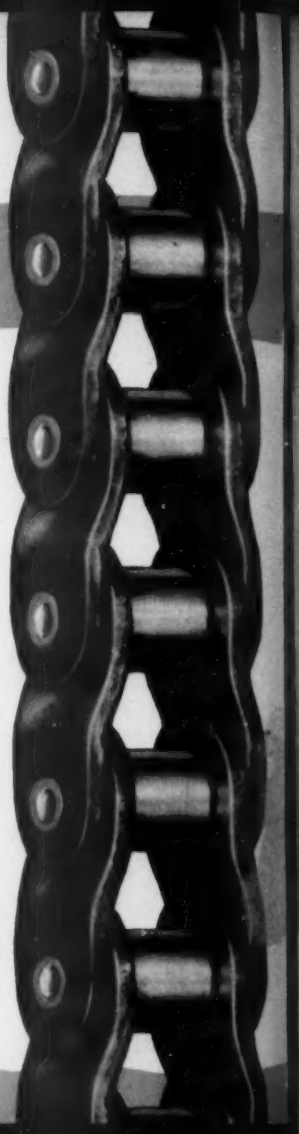


Rex Offset Side Bar Roller Chains are easy to couple . . . to alter length by one or more pitches.

Rex Offset Side Bar Roller Chains were "born in the oil fields" . . . designed to answer the need for a chain for exposed drives where conditions of dust, dirt or occasional misalignment make standard roller chains unsuitable.

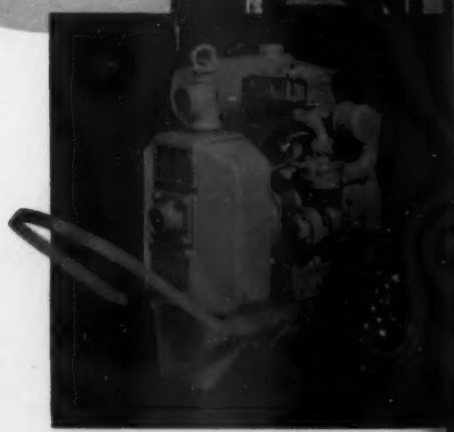
These chains are designed with built-in clearances between working parts that enable the chain to stand up under adverse operating conditions. The rotary table drive, for example, is typical of the type of service where Rex Offset Side Bar Roller Chains are the ideal answer.

These chains are similar to the famous Rex A.P.I. Chains in general appearance . . . have the same basic offset side bar construction. However, they are built to the same close tolerances, to the same finishes and dimensions of standard roller chains. The offset design makes it easy to alter the length of chain by one or more pitches at any point in the chain.



REX OIL FIELD PUMPS

the Little Yellow Pumps That:



You find everywhere in the oil fields, doing everything from dewatering ditches to salvaging oil from the pits.

The exceptional all-round portability of these handy self-priming centrifugals, plus their outstanding durability and efficiency, makes them the top choice for oil field utility service.

Pump body is pressed steel that's unbeatable for durability . . . can be repaired by welding. The exclusive Rex adjustable "air peeler" and replaceable wearing plate assure new pump efficiency for the lifetime of the pump. All these *plus* advantages mean better service with less maintenance and repair costs to you.

Rex Oil Field Utility Pumps are available in a range of capacities to fit every oil field service.

Rex Oil Field Sales Offices Are Located in the Following Cities:
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REX CONSTRUCTION MACHINERY DIVISION
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TOP PERFORMANCE AT ROCK BOTTOM COST

WITH THE GUIBERSON

TYPE "B" TUBING SPIDER

Stock sizes 1" to 3"; spiders are available on special order for 2" x 1" and 2½" x 1¼" parallel strings.

The Guiberson Type "B" tubing spider is a fast-handling, light-weight tool that can be handled by one man if necessary — and the cost of the "B" is light-weight, too. No other spider in its class offers greater economy, either initially or in the long run.

Despite its exceptionally light weight, the Type "B" spider will hold the longest string, and release instantly without sticking when you pick up. All slips fit the same bowl, and the "B" will not distort or damage tubing. Self-equalizing slips with hard, sharp teeth, give full, large-area contact, assuring positive grip, better load distribution and perfect release.

For positive performance, maximum protection, amazing handling ease and surprisingly low cost, you can count on the sure-grip "B" Tubing Spider.

SAFE THAN SORRY — GUIBERSON — BETTER BE

SOLD BY LEADING OIL FIELD SUPPLY STORES EVERYWHERE

THE GUIBERSON CORPORATION

Established 1919 — Dallas, Texas U. S. A.

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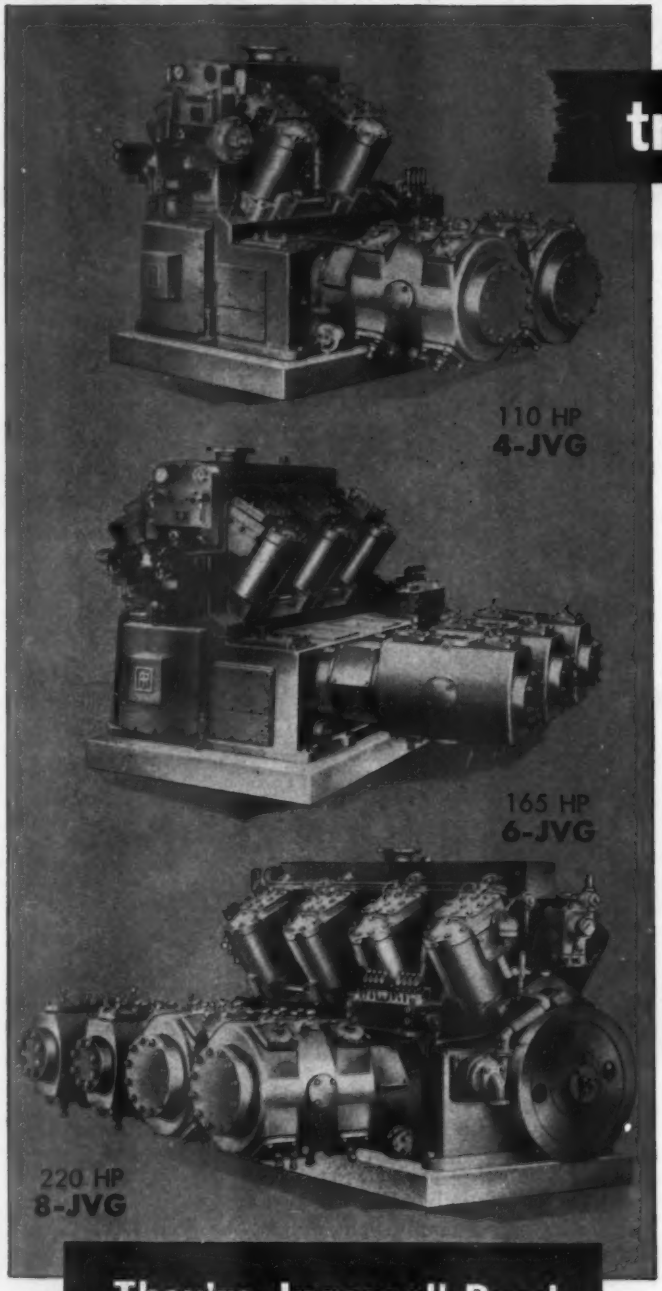

try these for size

...and economy!
...and performance!

The light-weight, gas-engine-driven JVG is now available in three sizes ... 110, 165, and 220 horsepower ... for refinery or oil field service. Excellent running balance of these Ingersoll-Rand 4-cycle V-angle compressors, needing only small foundations, makes them ideal for skid mounting and jobs where frequent relocation is necessary.

The JVG is designed for maximum flexibility of loading, to meet any pressure conditions ... any gas ... any service. Maintenance men and operators praise its heavy-duty construction, economy of fuel and lube oil, and simplicity and compactness. They also like the perfect combustion and smooth, quiet 4-cycle operation under all load and speed conditions.

These units will meet your most exacting specifications for high efficiency, conservative rating, long life and low maintenance ... whether the job be for semi-portable use or permanent installation. Consult your nearest I-R representative for complete details.

Horsepower	Width	Length	Height
110	6'-2"	8'-5"	6'-3"
165	8'-3"	8'-5"	6'-3"
220	10'-4"	8'-5"	6'-3"

They're Ingersoll-Rand
JVG
GAS-ENGINE-DRIVEN
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COMPRESSORS • AIR TOOLS • CONDENSERS • ROCK DRILLS • TURBO BLOWERS • CENTRIFUGAL PUMPS • OIL & GAS ENGINES

Types XVG, SVG and KVG gas-engine-driven compressors are available for installations requiring larger horsepower ratings.

They Say—

Tidelands Confiscation

"Only Congress can now save this nation from the disgraceful spectacle of federal confiscation without compensation."

Rep. Ed Gossett of Texas, author of bill to give states control of offshore oil.

Toward Nationalization

"If they can take the tidelands, they may figure they can just as well take any other land. And that could lead to nationalization of our oil industry."

Fred W. Shield, former president of Independent Petroleum Association of America.

Socialistic Dream

"It (the tidelands decision) is an extension of its (the administration's) present policy to extend greater bureaucratic control over all of the natural resources of our country. It is a move to further plunder and rob the states of their rights guaranteed them under the Constitution.

"Unless checked by the power of Congress, this dictatorial and socialistic extension of power will eventually take over the coal-mining industry, the great railroad-transportation systems, and doubtless the steel industry of the nation.

"The federal Government has extended this power and control over practically all of the water power of the United States, and the Federal Power Commission has taken over control and usurped much of the power of the states.

The Federal Power Commission is now reaching out for control of all sales of natural gas. The decision of the Supreme Court, following out the policies of this administration that all natural resources belong to the people, is rapidly making their socialistic dream come true."

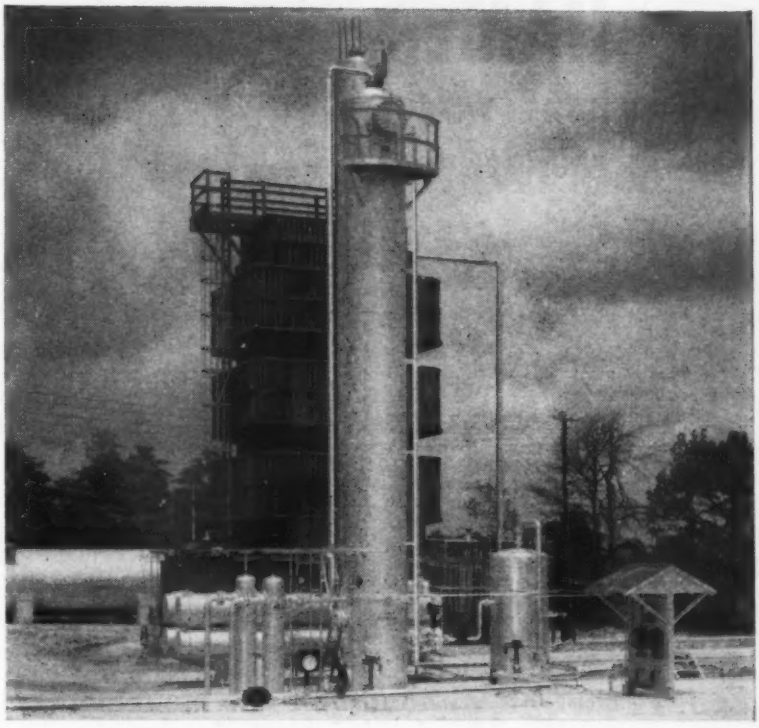
Rep. Charles W. Vursell of Illinois.

For Federal Control

"The court's (tidelands) decisions clarify, but do not definitely settle, the question of the future disposition of these immensely valuable properties. For the court, asserting the 'paramount rights' of the national Government, has not held that that Government owns these properties outright, nor has it ruled that Congress could not enact legislation turning over these areas explicitly either to the United States or to the states individually concerned.

"It would seem to us, particularly in the light of the court's findings of a 'paramount' national interest, that

BLAW-KNOX GASOLINE ABSORPTION PLANTS



...have these BIG advantages:

- Completely Engineered Standard Units
- Guaranteed Performance
- Automatic Operation
- Prefabricated Piping
- Shop Assembled
- Skid Mounted
- Gas or Electric Driven Pumps
- Trade-accepted Accessories
- Low-cost, Easy Installation

Send Us Details of Your Requirements

Gas analysis...Maximum pressure...Temperature...Maximum volume at minimum pressure...% removal of butane desired.

We will submit our recommendations without obligation to you.

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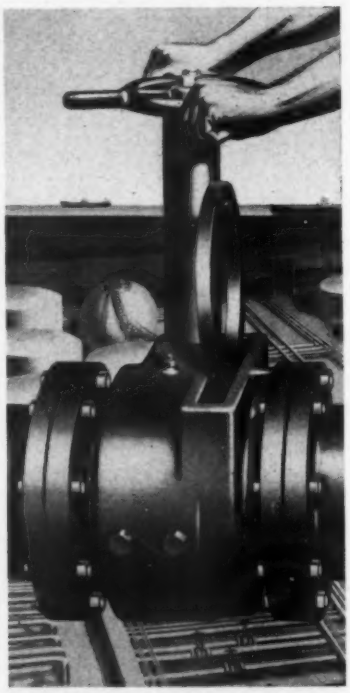
NOW BLIND RIGID LINES
in the COST-CUTTING

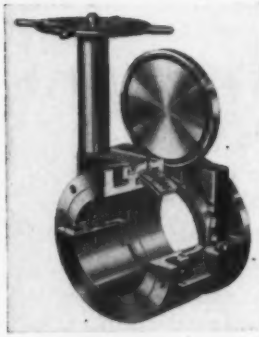
HAMER hand wheel operated way



When Hamer Line Blind Valves were introduced years ago, the old expensive and hazardous way of blinding pipe lines with a spectacle bolted between companion flanges became obsolete. The Hamer family of positive, one-man operated line blinding units has now grown until there is *a Hamer Line Blind Valve for every application*—EVEN FOR BLINDING RIGID LINES where no endwise movement is possible.

The new "RIGID" Line Blind Valve solves the problem of blinding inflexible lines in refineries, process plants, tankers and other ships...wherever rigid piping installations must be opened and closed. *It's speedy and cost-cutting*—one man can reverse the plate in one minute. It's *safe*—enclosed plate slot prevents spilling line fluid. *It's positive*—there's nothing like a solid plate for a permanent, leak-proof shut-off.

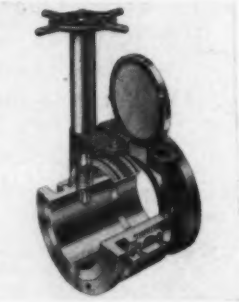
Positive shut-off without pipe line movement!



Actuated by the hand wheel, a smooth-turning ball bearing mounted ring gear moves the sliding internal sleeve in a straight line to clamp and release the plate, eliminating the need for spreading the line. "RIGID" Line Blind Valves conform to A. S. A. Standards for face-to-face dimensions of steel wedge gate valves. In planning new layouts, or modernizing existing installations, use a gate valve for blocking but specify Hamer "RIGID" Line Blind Valves at every point where quick, one-man operated, POSITIVE SHUT-OFF will be required.

LEFT—"RIGID" LINE BLIND VALVE

RIGHT—SPOOL-TYPE LINE BLIND VALVE



SPEED, ECONOMY, SAFETY IN BLINDING FLEXIBLE LINES!

There are Hamer Line Blind Valves for every blinding application. All models feature cost-cutting "one-man, one-minute" operation, positive shut-off, and long service life. Write for full information.

Illustrated below are: 1—Spool-Type, side hand wheel. 2—Spool-Type, upright hand wheel. 3—"Tee" and "Ell" Type. 4—Economy 3-Bolt Type.

SEND FOR CATALOG

HAMER LINE BLIND VALVES • • • • • • • • • • • • • • • • Non-Stick PLUG VALVES

OIL TOOL COMPANY

2919 GARDENIA AVENUE, LONG BEACH 6, CALIFORNIA

the production and conservation of offshore oil would be carried on by private interests both more appropriately and more effectively under federal than under state control."

Editorial in New York Times.

For Resid Imports

"The curtailment of residual-oil imports would not be reflected in any important increase in domestic production of crude oil. Residual oil is the unprofitable end product of the refining process, the refiners' realization thereon being almost always less than the cost of the average barrel of crude from which it is extracted. Reduced imports of residual oil probably would drive the price for this product upwards, but it is unlikely that our domestic refineries would run much more domestic crude or produce more residual oil as a result."

Charles L. Harding, director of Socony-Vacuum Oil Co., Inc., before the Senate committee on labor and public welfare.

Against Resid Imports

"The rising flood of imported crude petroleum and petroleum products, notably residual fuel oil, presents problems of vital importance to independent refiners.

"Chief among the imported petroleum products is residual fuel oil. Residual fuel oil represents about 22 per cent of an average barrel of crude oil. This product failed to pay its way and competitive factors for other products from the same barrel of crude oil made it impossible for other products to subsidize residual fuel oil.

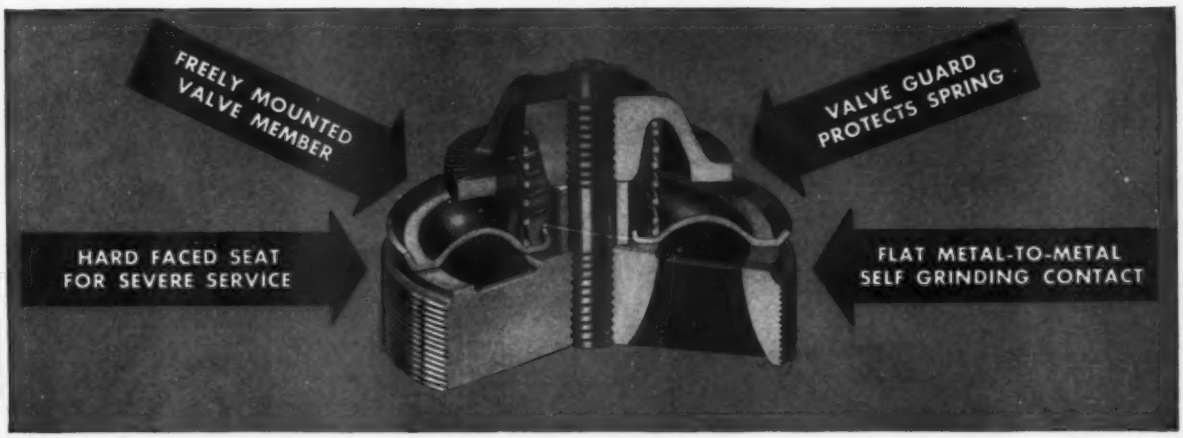
"It has been contended by some importers that it is essential to import residual fuel oil because there are insufficient domestic supplies. But this reasoning is just too pat; the difficulty is that it is not true or need not be true. Domestic refining capacity has been shut down, and fields producing heavy crudes which contain a large percentage of residual fuel oil have been shut in or their production has been severely curtailed because of the displacement of domestic residual fuel oil by the very imports claimed to be so essential. . . . More than sufficient heavy crude is available to produce all needed residual fuel oil supplies without appreciably increasing the production of lighter petroleum products.

"As it is, the low-cost crude and residual fuels imported to the East Coast have reached farther west for a market than is normal, pushing back into still farther western areas locally produced products creating new surplus problems."

V. E. Smith, vice president of Independent Refiners Association of America, before the Senate committee on labor and public welfare.

DURABLA

METAL PUMP VALVE UNITS KEEP YOUR PUMPS IN SERVICE


FREELY MOUNTED VALVE MEMBER
VALVE GUARD PROTECTS SPRING
HARD FACED SEAT FOR SEVERE SERVICE
FLAT METAL-TO-METAL SELF GRINDING CONTACT

1 **THEY ARE SELF-GRINDING:** Durabla Valve Units*, utilizing the freely mounted arched construction valve member exclusive to Durabla, are self-grinding, as the flat portion of the valve member is in direct contact with the flat valve seat and is free to move about its axis, thus producing a constant self-grinding action.

2 **VALVE SEATS ARE HARD FACED FOR SEVERE SERVICE:** Providing a seat surface hardness of Rockwell C-48-52 (approximately 500 Brinnel) or more in special valves, Durabla Valve Units have a long record of effective service with FLUIDS CARRYING SUSPENDED ABRASIVE SUBSTANCES. The metal valve member effectively prevents the pitting or "pick-up" of abrasive substances sometimes occurring with valves made of other materials.

3 **VALVE SPRINGS AND VALVE STEMS ARE PROTECTED:** The Valve Guard protects the Valve Spring from ever compressing more than 50% of its length. The Valve Stem is protected against breakage by the free mounting of the Valve Member.

Economy, efficiency and adaptability, based on long established service records and exclusive design make Durabla Valves your guarantee of reliable, uninterrupted pump operation.

You can specify Durabla Valves when you order a pump, (many manufacturers use them as standard equipment), or you can order Durabla Valves to fit any type of reciprocating pump, (they come with drive-fit seats or threaded seats with or without a shoulder to suit the job).

TO AVOID "PUMP TROUBLES" SPECIFY DURABLA VALVES

Address DURABLA Engineering Department for information and bulletin: Reference OG-6

*Patent Numbers 2090486, 2117504

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114 LIBERTY ST. NEW YORK
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WeldOlets, Butt Welding — Available as standard, with outlet sizes from ⅛" to 24", both straight and reducing for use with Schedule 40 pipe up to 12" outlet. Outlet sizes 12" - 24" for standard weight pipe (⅜" wall). Also available for Schedule 80 services through 8" outlet and extra strong through 24" outlet size (for use with pipe having ½" wall).

You write

SPEED, ECONOMY AND FULL PIPE STRENGTH

into the job when you specify WELDOLETS

With WeldOlet branch pipe welding fittings you provide the quickest, most economical, most satisfactory method of obtaining full pipe strength at branch connections.

Note in the above illustration how the WeldOlet tapers to provide a single bevel groove joint at the crotch section and blends into a V-butt joint at the ear portion.

WeldOlets need no additional reinforcement to establish and fully maintain original strength on ASTM A-106 Seamless Steel Grade A Pipe, as set forth in Code for Pressure Piping, American Standards Association, B31.1-1942, and Supp. No. 2, B31.1-b-1947.

To meet special conditions, these fittings can be furnished in any forgeable metal including wrought iron, toncan iron, nickel, Monel, Everdur, stainless grades 304, 316, 347, etc.

For detailed engineering reference data, write for Catalog W-2.

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FOR WELDED BRANCH PIPE OUTLETS

WeldOlets, Socket Welding — Available as standard, with outlet sizes ⅛" - 10", both straight and reducing, for use with Schedule 40 pipe. Also available in Schedules 80 and 160 up through 4" outlet size.

ThredOlets — Available as standard, with outlet sizes ⅛" - 10", both straight and reducing, for use with Schedule 40 pipe. Also available in Schedule 80 up through 2" outlet size.

Fig. 1—Cut-away view of reducing size WeldOlet with welding outlet in place. The external rib and wide bases or footings of WeldOlets eliminate the need for extra supports to take care of bending or vibrational stresses at crotch section, the point of greatest stress.

Fig. 2—Note blending of ear portion of welding fitting to run pipe. Extension of weld metal below inside scarfed portion of pipe insures all sections of joint greater than pipe wall thickness.

Imports Not Unfair

"We believe that imported oil is a necessary supplement to domestically produced oil and does not constitute unfair competition with coal.

"It does provide fuel which is not economically available from domestic sources. As a supplement to domestic production, it is necessary not only to fuel users, but to the domestic industry itself.

"I also want to add that we feel most of the business the coal industry lost in the past few years was lost because of technological developments like increased use of diesel locomotives and the utilization of more natural gas.

"We have always been perfectly willing to compete with the coal industry on the grounds of product quality, product supply, customer preference and price."

Eugene Holman, president of Standard Oil Co. (N. J.), at annual stockholders meeting.

For a Rainy Day

"Twenty million dollars. That's a lot of money, isn't it? But last year, Shell put even more than that amount aside as savings for its employes. In 1949, Shell contributed to employes' accounts in the provident fund more than nine and a half million dollars, and it paid an additional eleven million into the pension reserve. All of this money will some day be paid to eligible Shell employes.

"Figures recently released by the head-office personnel department reveal that during the year 1949 the cost of employes benefit plans, which included provident - fund company contributions, pension reserve, social security taxes (company), vacations and holidays, sickness and disability benefits, and workmen's compensation insurance, amounted to a total of $34,336,041.44. This figure represented 26.31 per cent of total wages and salaries.

"Every employe can point with justifiable pride to the fact that for each dollar he received from the company in wages and salaries, the company spent an additional 26 cents to provide liberal benefit plans for him.

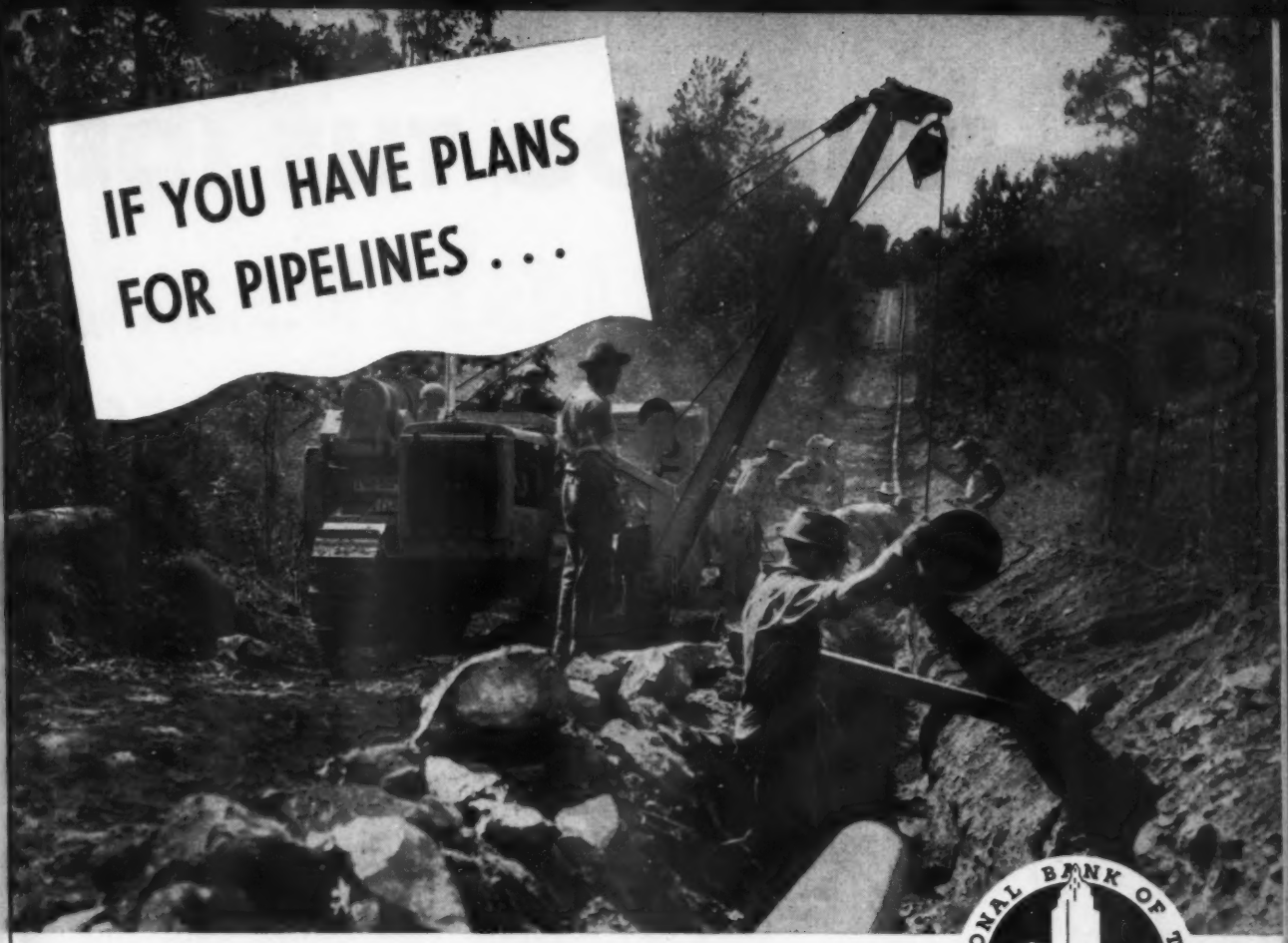
"Through the farsightedness of the company, employes do indeed save for a rainy day."

The New Oiler, published by the New Orleans office of Shell Oil Co.

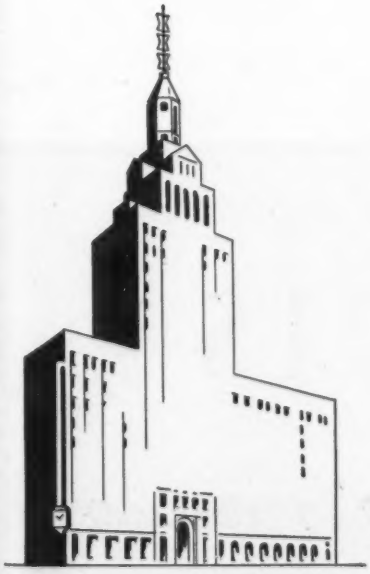
Swap for Crude?

"Canadian crude may be refined in the United States, because as time goes along it may be to the advantage of both countries economically and geographically to, in effect, exchange crude with each other rather than haul oil to markets a greater distance from sources of supply."

H. H. Hewetson, chairman of the board, Imperial Oil, Ltd., addressing the Chamber of Commerce, New York.



Let NBT Furnish Your Financing



National Bank of Tulsa can supply the sound financial assistance and consultation you'll need if you're planning a pipeline project — or any other oil industry activity. NBT's *oil bankers* know oil and "talk" oil; they have the resources and facilities available to finance large or small jobs; they have the desire to serve you. Come in and discuss your plans with them.

The Oil Bank of America

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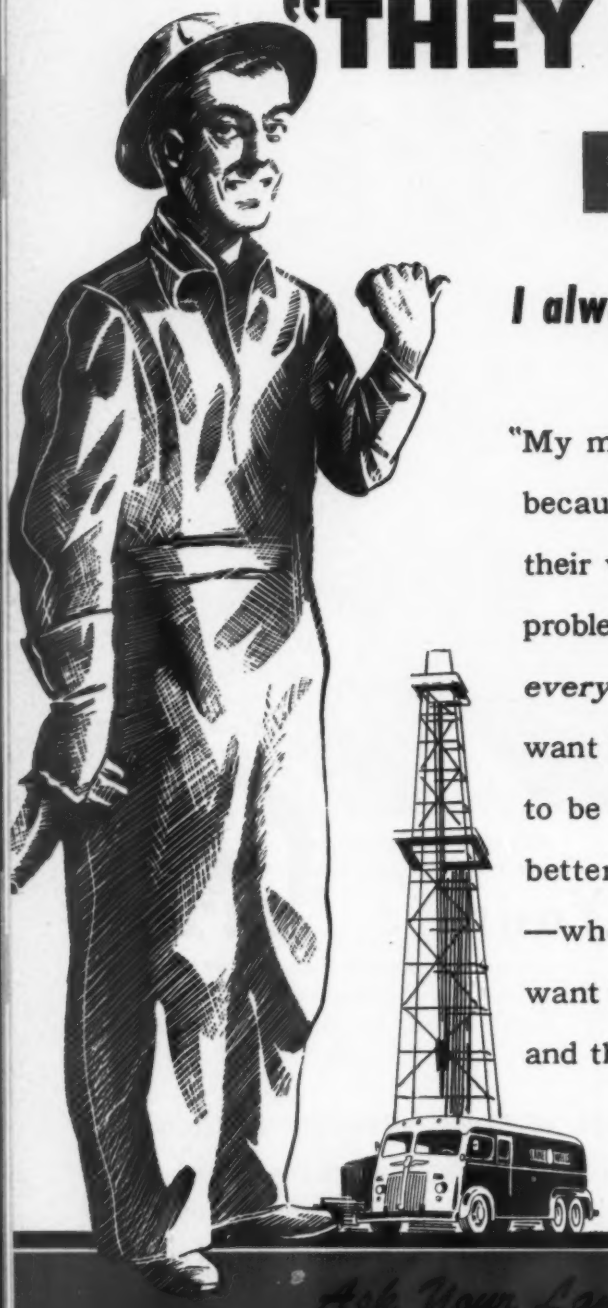
"THEY DO THE JOB RIGHT — that's why I always use LANE-WELLS"



"My mind is easier with Lane-Wells on the job, because their 16 years of experience shows in their work. They know their job, they know my problems, and they have the equipment to meet *every* kind of perforating job. Shots go where I want 'em—I've found their depth measurements to be very accurate. Penetration? Sure—none better. And Lane-Wells really gives me service—where I want it, when I want it, the way I want it. They get results: that's what I'm after—and that's what you're after, too."

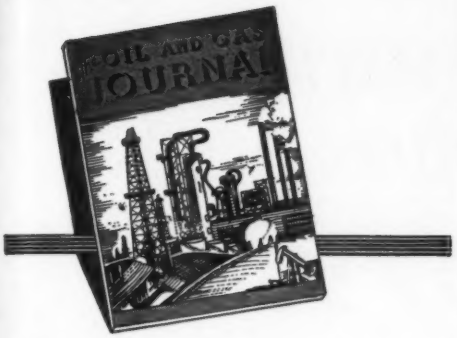
AG-305

Ask Your Lane-Wells Man About

LANE-WELLS

TECHNICAL OILFIELD SERVICES

Better Perforating



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JOURNALLY Speaking

Vacuum Doodle

POKING around the Gulf Coast in search of special articles for this issue, Leigh McCaslin picked up a good doodlebug story, but since our engineering editors turn up their noses at doodlebugs it found its way to this department.

It happened 25 or 30 years ago to a land agent who didn't trust the drinking water in the country so always carried a big nickel-plated vacuum bottle in a leather case. One day he tackled a farmer who refused to lease his land unless it were tested by "experts with modern equipment." Undaunted, our agent unstrapped his vacuum bottle and began walking around, turning it over and over and gazing intently into the reflections on its shiny sides. Finally he came under a tree where the leaf shadows made an intricate pattern, and gravely informed the farmer that he could see oil in the darkest shadow.

Much impressed, the farmer agreed to lease, but wanted a fancy price. So the agent again resorted to his trusty doodlebug. He copied down the patent number from the bottom, divided by the number of acres, multiplied by the size of his hat, and finally came out with a price of $3 an acre. The farmer was disappointed, but had faith in modern scientific equipment, so signed up. The company drilled all over the farm and never got a show of oil.

Moral: The use of vacuum does not improve the efficiency of a doodlebug.

Not "Dry"

AMONG the special articles in this Gulf Coast issue is one about the first wells in Caddo Lake field back in 1908.

This reminds us of a legend of another Gulf Coast discovery of about the same vintage, an anecdote which may not be flattering to the engineering profession of that day—nor to the temperance movement—but does illustrate how the oil industry learned reservoir engineering the hard way.

It seems that the well was a duster, and the company capped it and moved on, much to the disappointment of the landowner. The well was dry but he wasn't, so he proceeded to seek liquid solace from a bottle, a quaint old custom of that pioneering era. Those were the days when a quart was a quart, not a fifth, and after downing an unrecorded number of cups that cheer he convinced himself that the company had actually discovered oil but was trying to cheat him out of his royalty.

Staggering out to the derrick, he draped himself over the gate valve and gave a tug. He was nearly drowned in a flow of oil. The well had drilled itself in by the gas pressure which had built up in the hole.

We can't vouch for this story, but the way we heard it, for many years around those parts Demon Rum was given credit for a discovery which the rock hounds missed. Nowadays, of course, bottles are used around drilling rigs only to hold samples of oil, and wells are completed by methods far more scientific, though not always more successful.

Bureaucracy Offshore

NOW that the Supreme Court has said that the federal Government has paramount rights (whatever that means) to Texas and Louisiana offshore oil, the Interior Department wants Congress to give it $50,000,000 to make a survey.

The purpose of a survey, of course, is to gather data for a proposal, which would go to an interdepartmental coordinating committee as the basis for formulating a plan. Then, after a couple more surveys, the Government could activate the plan into a project for developing offshore oil resources.

Nothing is said of the fact that oil industry already has made its own survey, skipped the intermediate steps, and is well along on development, without any cost to the taxpayers. It's a great Government.

—Henry D. Ralph

'Starcor' HAS KEPT EVERY PROMISE IN DEEP-WELL CEMENTING

Ever Since 1936

● Now in its 14th year of oil-field service, 'STARCOR' has a distinguished record of successful performance in thousands of the nation's deepest wells and at this moment is safeguarding investments of hundreds of millions of dollars in successful completions.

Oil Men use 'STARCOR' with assurance which increases with every passing year — based upon their own experience that 'STARCOR' performs exactly as they expect it to—from well to well, from month to month, from year to year.

'STARCOR'*, one of three great Lone Star Cements—made by a quality-minded organization which constantly studies drilling problems in terms of cement properties and performance—to provide cements made-to-measure for oil-field requirements. *Reg. U.S. Pat. Off.

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D. H. Stormont.....650 S. Grand, Los Angeles
Carl F. Hoot....Mercantile Bank Bldg., Dallas
Victor Lauriston 35 Stanley Ave.,Chatham,Ont.
Bertram F. Linz..621 Albee Bldg., Washington
Leigh S. McCaslin, Jr..Sterling Bldg., Houston
John C. Reidel.....211 S. Cheyenne, Tulsa
William P. Sterne.....211 S. Cheyenne, Tulsa
Roy F. Carlson..Mercantile Bank Bldg., Dallas
Polly DeArmond.....Editorial Assistant, Tulsa
Lucy Dee Owen...Editorial Assistant, Houston

CORRESPONDENTS AT

Denver, Colo. Calgary, Alta.
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Calling a Spade—

Earlier in the year we attended a Washington conference of business-paper editors which included an interview at the Department of Justice. Representatives of the department asked for comments regarding its work.

Food-industry editors said the pending antitrust action against a large food chain did not have public support. Their visits around the country had convinced them that the prompt denial of the charges through the newspapers, with factual information regarding its activities, had brought public approval for the defendant company.

With the background of what is taking place in the food and other industries, we have been pleased with the frank statements that are coming currently from representatives of oil companies who are involved in recent suits, court decisions, and investigations by Government.

"We consider this action to be the gravest injustice ever lodged against the oil industry," said President Peterson and Chairman Follis of Standard Oil Co. of California regarding the D. of J. suit against that company and six others under the antitrust acts. The statement, released last week, continues:

"A study of the 44-page complaint reveals the now familiar technique by which a hodgepodge of charges is thrown at us in the obvious hope that one or two of them will stick. This is the usual device of cynical lawyers who lack the evidence of clear-cut violations of law. It also serves as political propaganda."

This is language that people at the four corners and at the crossroads can understand and appreciate.

A Congressional investigation was proposed last week primarily because the price of gasoline was advanced one-half cent per gallon in Detroit area.

But Standard Oil Co. (Indiana), which initiated the increase, explains it. The company says: "Wages of Standard employes in Michigan have been advanced twice to keep pace with the general increase in wage level. Costs of practically everything else the Standard buys have increased as they have for everyone. Standard has done well to hold back the price advance so long. Contrary to statements, profits are not at record levels."

Time was when established precedent called upon a company or individual in a government suit or investigation to await the courtroom or the hearing room to present their case. Then the prosecutor as well as the defendant was content to follow a procedure based on the accepted fact that the defendant was innocent until proven guilty.

Now the investigator and prosecutor rush to the press and radio with reckless charges and implications which they never expect to prove but which have value in promoting political aims, which is the main objective.

Calling a spade a spade in these matters by those concerned, over a period of time will bring a public reaction which will be understood even in Washington.

XUM

THIS WEEK

WASHINGTON—Congressional committee reports for and against restrictions on oil imports expected soon. . . . ¶Bill for state control of offshore oil bogged down in House. . . . ¶Senate gets factual study of RFC financing of Carthage Hydrocol, Inc. . . . ¶Truman vetoes bill to clarify antitrust laws on use of delivered prices. . . . ¶NPC will make study of Bureau of Mines estimates of costs of synthetic fuels. . . .

PRODUCTION—Magnolia's big discovery well in Midland County stimulates interest in potentialities of very deep production. . . . This is the fourth recent discovery in the Ellenburger at below 12,000 ft. in this part of Texas. . . . ¶Penn Grade research points to many improvements in economics and ultimate recovery of secondary-recovery projects. . . . ¶Texas raises allowables for fourth consecutive month. . . . ¶Texas Railroad Commission considering order cutting gas-oil ratio. . . .

TRENDS—Production of crude and field condensate is expected to average about 5,345,000 bbl. daily for June. . . . Deducting exports, transfers, and losses, this will cover runs of about 5,185,000 bbl. daily. . . . ¶Crude has been imported at the rate of about 430,000 bbl. daily for past 5 weeks. . . . At this rate, total runs to stills can average 5,615,000 bbl. daily without draft on crude stocks. . . .

PRODUCTS—Halt to octane race asked by Shell's Doolittle. . . . Says wide use of high-octane gasoline wasteful until technology develops way to make it cheaper and with less waste of other oil products. . . . ¶Bureau of Mines survey shows that octane numbers of all gasoline jumped rapidly during recent months. . . . ¶S.A.E. makes new classification in lube oils. . . . Adds new light grades, drops heavy, requires new cold test. . . .

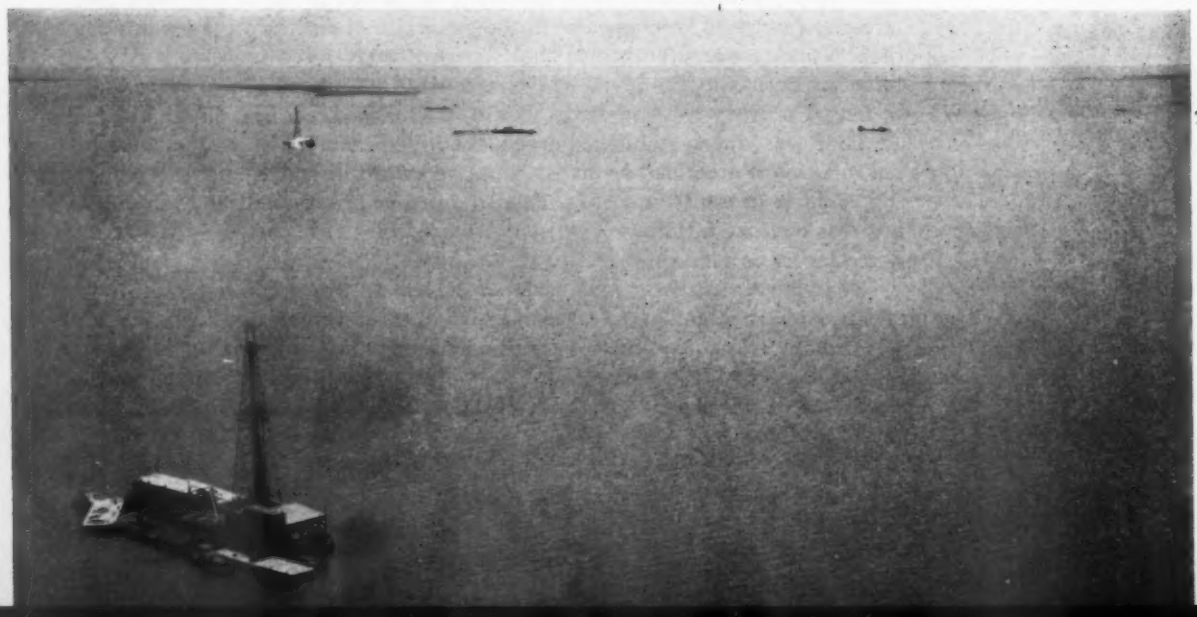
ACTIVITY—Crude production for week ended June 17 averaged 5,279,150 bbl. daily, an increase of 32,900 bbl. daily over previous week and 419,300 bbl. daily over same week last year. . . . ¶Total completions were up 18 wells to 851 for the week. . . . Wildcat completions were off 14 wells to 148, still 3 wells more than same week last year. . . . ¶Rotary rigs operating in United States on June 12 totaled 2,181, another high for the year. . . .

TECHNOLOGY—Submarine pipe line will be laid 9 miles into the Gulf to gather gas from offshore field. . . . ¶New Salt Lake pipe line first to use radioactive tracers in batching products. . . . ¶Experiment in drilling shot holes with air instead of mud may eliminate water problem in seismic work. . . . ¶Prefabricated catalytic cracking unit designed to cut installation costs for smaller refineries. . . .

INTERNATIONAL—World crude production hits new high record in April of 9,769,100 bbl. daily. . . . Most foreign countries now producing 10 to 20 per cent above a year ago. . . . ¶Britain's latest note on sterling-dollar oil controversy offers no permanent settlement but individual company agreements are progressing. . . . ¶Israeli officials seeking ways to reopen Haifa refinery. . . .

PIPE LINES—Texas Illinois Natural Gas Pipe Line Co. gets FPC approval for 1,300-mile line from lower Gulf Coast to Chicago area. . . . Work will start immediately on the 30-in. line, estimated to cost $117,000,000. . . . ¶Work progressing rapidly on Mid-Valley crude line of Sun and Sohio companies. . . . 120-mile section now operating and rest of 1,000-mile line due for completion in October. . . . ¶Humble opens new crude line from West Texas to Houston area.

THE GULF COAST.—Typical of coastal oil operations along Texas and Louisiana shores is this view of Lake Raccourci field in southern Louisiana where Humble Oil & Refining Co. found production at 14,467 ft., the deepest on the Gulf Coast. Two barge rigs are drilling currently, and in the background are the platforms of completed wells and a battery of lease tanks. Rig in the foreground is Humble's 2,780-hp. diesel-electric Rig 20, the most powerful in existence. Vast water stretches like this are the subject of an ownership dispute between federal and state governments, but oil operations on the Gulf Coast are continuing at a high rate, as detailed in the special section beginning on page 165 of this issue.



Reports on Imports

Two congressional committees completing their reports; one asking drastic restrictions, one advising caution

Bertram F. Linz

WASHINGTON. — A report urging that prompt action be taken to restrict imports of foreign oil is expected to be submitted to the Senate this week by Sen. Matthew M. Neely of West Virginia, chairman of a labor subcommittee which has been investigating the effect of imports on employment in the domestic oil and coal industries.

But a report opposing any drastic increase in the import tax or imposition of a quota is also expected to be submitted to the House by Rep. Eugene J. Keogh of New York, chairman of a small business subcommittee which also has been studying the oil import situation.

While it is anticipated that Keogh will call for a careful approach to the import problem, he is represented as believing that the situation merits some consideration and, if encouraged, might introduce legislation to provide exemption from antitrust action for importing companies which participate in a voluntary agreement to restrict imports.

Keogh's report is expected to be in line with a recent progress report of the House interstate commerce oil subcommittee which recommended that Congress move slowly and carefully in dealing with imports because of the many factors involved—international relations, investments of American companies, and the like.

Rathbone testifies. — As Neely prepared to close several weeks of hearings, M. J. Rathbone, Standard Oil Co. (N. J.), director, defended his company's import policies and the importation of foreign oil in general in a 2-hour appearance before the Senate subcommittee.

Rathbone reviewed the statement on imports submitted previously by Eugene Holman, president of Standard, and asserted that they can be held responsible for only a small proportion of the unemployment of which the coal industry complains.

A statement also was submitted by Gov. Roy J. Turner of Oklahoma, who declared that the full effects of 18 months of heavy imports have not yet been fully felt by the domestic industry, whose health is seriously threatened.

Turner referred to his recent statement before the Interstate Oil Compact Commission that the oil industry was in very healthy condition, explaining that this applied to the domestic situation as measured by potential production, market demand, and newly discovered reserves. This healthy condition, he asserted, was due primarily and almost exclusively to the state regulatory agencies which, by reducing domestic production in ratio to the rising tide of imports, have prevented the "absolute chaos which otherwise would have resulted from these imports."

Residual needed.—Rathbone endeavored to explain why the importing companies consider the sale of foreign crude and residual in this country to be necessary, but without observable effect upon Neely.

He submitted figures showing that residual fuel oil has been imported regularly over a period of years, explaining that domestic refiners are not able to supply the demand because of great advances in refining technology which have reduced the yield of the end product.

In the event that imports of oil should be cut off, Rathbone said, domestic production of crude would be stepped up to the extent of the foreign crude excluded, but imported residual would not be made up because "enlarging output of domestic residual fuel oil other than as byproduct would mean the deliberate downgrading of crude oil into fuel oil, the value of which is usually well below that of crude oil.

"Since there is no economical way of meeting, from domestic sources, the full demand of American consumers for heavy fuel oil, the importation of heavy fuel oil has furnished the means for taking care of the marginal fuel-oil demand," he added.

Answering the contentions of spokesmen for the coal industry that the importation of residual has been responsible for their loss of markets and unemployment of miners, Rathbone compared increases in imports with the loss in coal consumption for general industrial uses and by railroads and utilities and demonstrated that increased residual demand accounted for only a small part of the drop in coal requirements. Further, he said, experience has shown that coal demand rises and falls in close relation with the expansion and slowdown of industry, and coal consumption currently is not out of line with industrial activity.

Coal competition.—"The figures indicate that the decline in the output of coal in 1949 was due in large measure to technological developments in the use of other fuels, uncertainty regarding coal supply, loss of export markets, reduced industrial activity, and overproduction in the previous year, and that only a relatively small part of the reduced output of coal in 1949 can reasonably be attributed to direct displacement of coal by imported fuel oil," Rathbone testified.

Rathbone agreed that a high tariff on residual would mean an increase in price to consumers and said in that event many present consumers of oil would go back to using coal. Similarly, consumers would return to coal if imports of residual were entirely cut off.

"That is just what we want," Neely declared, adding that he cannot offer theories of what constitutes desirable imports "to satisfy unemployed coal miners in West Virginia that they haven't lost their jobs to imported oil."

Tidelands Stall

States' rights bill bogged down in House

WASHINGTON.—Tidelands legislation was left hanging on the hook last week when the House rules committee held hearings on sending it to the floor but was unable to get a quorum to take a vote.

Supporters of the legislation were indignant over the treatment given the bill, which would restore title in the tidelands to the states, and Rep. John E. Lyle of Texas called it a deliberate stall when Rep. Ray J. Madden of Indiana walked out of the room while Lyle was talking and reduced committee attendance to 6 of its 12 members, less than a quorum.

While the committee's inaction may delay and even prevent getting the bill up for House consideration, it is not seen as making any difference in the final outcome, for it is generally agreed that action by the Senate is unlikely this year. Even should the bill take an unexpected speed and pass both houses it is conceded that approval by the President is a remote possibility.

Both supporters and opponents of state ownership appeared before the rules committee to repeat the arguments that have been made over the past several years. Representatives Lyle, Francis E. Walter of Pennsylvania, and Ed Gossett of Texas said that the Supreme Court decisions have so clouded the title of the offshore lands of all states that action should be taken immediately to settle the matter, while Congressmen Emanuel Celler of New York and Sam Hobbs of Alabama denounced the alleged oil-company "grab" which they saw behind the legislation.

XUM

Hydrocol Financing

Senators review RFC loan for Carthage synthetics plant; debate whether it is risk capital or secured investment

WASHINGTON.—A Senate subcommittee probing the activities of the Reconstruction Finance Corp. attempted last week to uncover the basis for a $18,500,000 loan to Carthage Hydrocol, Inc., whose plant for production of motor fuels and alcohols from natural gas will shortly go into production.

Sen. J. William Fulbright of Arkansas, chairman of the banking subcommittee, learned, however, that only one member of the board which passed on the loan is still with the RFC and that none of the officials available to him were familiar with the circumstances.

Fulbright made the point that while the plant is undoubtedly a good risk and will serve the public interest by making use of natural gas which, at the time it was projected, was being wasted, there is no provision in the RFC act for the making of loans on the basis of conservation of natural resources, and accordingly the RFC must have had other considerations.

The Carthage project was first advanced during the war, when it was estimated a plant could be built for about $16,000,000, and a commitment for an RFC loan of $6,000,000 was made in 1944 by former Secretary of Commerce Jesse H. Jones, who also was chairman of the loan agency.

Project endorsed.—At that time, the military, Interior, and other agencies were concerned over petroleum supplies and strongly supported the idea of making usable motor fuel from natural gas, according to a subcommittee staff study of RFC records. The Interior Department maintained its interest in the project, and in a letter to the RFC dated March 16, 1948, then Undersecretary Oscar L. Chapman, while withholding any opinion as to the practicability of the Carthage process, expressed the belief that the project "will be of great value as a means of increasing equivalent oil reserves."

The study showed that Carthage Hydrocol was organized with an authorized 200,000 shares of stock, of which 178,142 shares were distributed with Hydrocarbon Research, Inc., which developed and held the patents on the process getting 19,125 shares. The remaining stock, from the sale of which the company secured $167,750, was taken by eight oil and associated concerns which also subscribed to $19,500,000 of promissory notes, and an advance of $2,500,000 was made by Stanolind Oil & Gas Co., giving Carthage $40,667,750, including the loan. The cost of the plant and pipe line which will carry gas to it from the field will be about $37,500,000, it was said, and the remainder will be used as working capital.

The Texas Co. was shown to have the largest interest in Carthage, holding approximately 67,593 shares of its stock and taking notes for $7,312,500. Forest Oil Corp. and Niagara Share Corp. each took 18,281 shares of stock and notes for $2,437,500, and United Gas Corp. and La Gloria Corp. each took 14,625 shares of stock and notes for $1,850,000. The remaining subscribers were Stone & Webster, Inc., 12,796 shares of stock and notes for $1,706,250; The Chicago Corp., 7,332 shares and notes for $975,000; and Western Natural Gas Co., 5,484 shares and notes for $731,250.

The first advance of RFC funds was $9,000,000 on April 8, 1946, and was followed by a loan of $3,500,000 April 12, 1948, and a third and final loan of $6,000,000 April 25, 1949. The first and last loans mature October 1, 1959, and the $3,500,000 loan matures January 31, 1955, all with interest at 4 per cent.

Soundness not questioned.—There was no apparent intention on the part of Fulbright to question the soundness of the loan or the objective of conservation of natural gas, and Carthage apparently was brought up to support his contention that in some instances the RFC provided equity capital or venture money, for which it has no authority. But the discussion developed that it is extremely difficult to draw a line between such money and a loan for facilities. Fulbright stuck to his contention that where a company, as in this case, had only less than $200,000 in equity capital and RFC provided $18,500,000, the Government was putting up capital. RFC officials held that money which has a definite date of repayment is not capital but purely a loan.

Fulbright suggested that when the RFC loan is paid off it may be possible for the companies to sell their notes at a premium, thereby taking a capital gain at lower taxes than would apply had they bought stock and taken dividends, but hastened to add that since this was permissible under the law he was not criticizing the companies.

Sen. Homer E. Capehart of Indiana was more outspoken, questioning the good faith of companies which demand the protection of free enterprise but go to the Government for help. This is not confined to the oil industry, he said, but, he pointed out, the companies involved in the Carthage project must be worth well over $1,000,000,000 and could readily have financed it themselves.

IN CUYAMA.—The second anniversary of its discovery of oil in Cuyama Valley was marked by Richfield Oil Corp. this month with the opening of this gas-processing plant in South Cuyama field. Double the size of Richfield's plant in near-by Russell Ranch field, opened in October 1949, the new plant has a processing capacity of 30,000,000 cu. ft. of gas daily. It will produce 150,000 gal. of liquid products daily and its 24,000,000 cu. ft. of dry residue gas will be reinjected into the reservoir. Fluor Corp. rushed the plant to completion in 226 working days.

Synthetics Study

NPC group will review bureau's cost figures

WASHINGTON. — The summer meeting of the National Petroleum Council will be held at the Interior Department July 25, it was announced last week by NPC Chairman Walter S. Hallanan.

Hallanan also announced the appointment of a committee on production costs of synthetic liquid fuels, in conformity with a request of Interior Secretary Oscar L. Chapman that a study be made of the Bureau of Mines estimates of the cost of producing synthetic fuels and of comparative costs of producing liquid fuels from petroleum. The committee also may prepare independent cost estimates and make recommendations, if necessary, for improvement of future estimates by the bureau.

In his request, Chapman pointed out that during and immediately following the last war, when the problem of adequate supplies of liquid fuels was grave and there was uncertainty as to whether the United States would have an adequate supply of oil in the event of another emergency, Congress authorized the bureau to investigate and develop processes for producing synthetic fuels from oil shale and coal. One of the requirements of the program was the construction and operation of demonstration plants to enable the Government to furnish industry with cost and engineering data for the development of a synthetic liquid-fuels industry.

As the bureau's work progressed, considerable difference of opinion developed regarding the accuracy of its estimates of production costs, and Chapman asked for the NPC study in order that the situation might be thoroughly aired and a determination made whether the bureau's figures properly reflected the actual costs that might be anticipated in the processing of oil shale and coal.

W. S. S. Rodgers, The Texas Co., New York, was named chairman of the committee by Hallanan, who also appointed K. S. Adams, Phillips Petroleum Co., Bartlesville; Hines H. Baker, Humble Oil & Refining Co., Houston; Max W. Ball, Washington; Bruce K. Brown, Pan-Am Southern Corp., New Orleans; Robert L. Foree, Texas Independent Producers and Royalty Owners Association, Dallas; John M. Lovejoy, Seaboard Oil Co. of Delaware, New York; R. S. Shannon, Pioneer Oil Corp., Denver; Reese H. Taylor, Union Oil Co. of California, Los Angeles; J. Ed Warren, Independent Petroleum Association of America, Midland, Tex.; L. S. Wescoat, Pure Oil Co., Chicago; and Robert E. Wilson, Standard Oil Co. (Ind.), Chicago, as members of the group.

WATCHING WASHINGTON

Bertram F. Linz

Oil Off Balance

The Truman administration appears to be rapidly approaching its objective of a balanced international trade as an aid to European recovery.

For the first 4 months of the year, the United States had a favorable balance of trade of only $724,000,000 as compared with $2,166,000,000 for the corresponding period in 1949, according to Census Bureau statistics.

The sole purpose of the administration's repeated reductions of import duties is to open the American market wider to foreign goods to permit the rest of the world to accumulate the dollars needed to buy here. But at the same time, one of the objectives of the European Recovery Program is to increase European production so that the Marshall-plan countries can make more of the things they need and reduce their imports from the United States.

That these steps appear to be having an effect is indicated by bureau figures showing that our total exports for the first 4 months of the year dropped to $3,195,000,000 in 1950 from $4,490,000,000 in 1949, while general imports increased to $2,471,000,000 from $2,324,000,000.

The only thing definitely demonstrated by the statistics is that in oil the United States already has a substantial adverse balance of trade. Imports of crude petroleum account for nearly 20 per cent of our total receipts of crude materials and amounted to $30,000,000 in April, for instance; exports represented about 6 per cent of the total foreign shipments of crude materials, and in April were valued at $8,700,000.

The Census reports cover imports of crude oil and gas and fuel oil and exports of those commodities plus lubricating oils and gasoline. They show that we imported a total of 24,729,000 bbl. of the items covered, valued at $46,400,000, in April, but exported only 7,805,000 bbl. valued at $34,500,000, resulting in an adverse balance of trade for the month of $11,900,000.

Lobbying Showdown

Rep. Frank Buchanan of Pennsylvania, chairman of the House lobby-investigating committee, who recently demanded that 166 corporations, including 10 oil companies, report on their expenditures in Washington and contributions to various organizations, is seeking to avoid a showdown in which he might be charged with having exceeded his authority.

Faced with the threatened refusal of several companies to comply with his demand, Buchanan quickly modified it to cover only such expenditures in Washington as were involved in efforts to influence legislation.

Following publicity regarding Buchanan's action his committee met and delegated to him the powers which it is charged he usurped. This action was taken after the event, however, and the question whether he acted legally can now be settled only by the courts. That is what the committee is trying to avoid.

His Master's Voice

The same kind of a campaign that influenced President Truman to veto the Kerr natural-gas bill was employed to beat the basing-point bill, and by practically the same interests.

The same argument that "it would put effective clubs into the hands of the big boys of industry" was used, the only difference being that instead of being oil companies the "big boys" were the steel and cement corporations.

In place of the city officials who charged the Kerr bill would increase the price of gas to the consumers who elected them, the spokesmen for "little business" spearheaded the drive against the basing-point bill, charging that they would be squeezed out of business.

Strongly supporting both drives was the C.I.O., which was not temperate in its language when discussing the bills as, for instance, when the C.I.O. News said "less publicized than the notorious Kerr bill to hike gas prices, S. 1008 carries an even more deadly wallop for the consuming public."

Industry has been operating under the restrictions of the Cement Institute decision for a couple of years and government statistics give no indication that the cost of living has declined when basing-point pricing was outlawed, but that was overlooked when the heat was turned on the White House.

XUM

New Midland Field

Magnolia's Parks wildcat tests 3,000 bbl. per day from deep Ellenburger pay under conditions like Pegasus field

Roy F. Carlson and Carl F. Hoot

DALLAS.—A new deep field for Midland County seems assured by the success of a wildcat of Magnolia Petroleum Co., the 2 Roy Parks, which indicated production of 3,000 bbl. per day on a drill-stem test made in the Ellenburger at a depth of nearly 13,000 ft.

The new well, which has tremendously increased interest in the deep production of the Midland basin area, is 11½ miles southwest of the town of Midland. The location is 660 ft. out of the northwest corner of Section 10, M. C. Daugherty Survey, on a block of 30,000 acres controlled by Magnolia.

It is about 12 miles north of Pegasus field, where Magnolia also holds the lion's share of acreage, the same distance north and east of Sweetie Peck field, and about 4½ miles southeast of the one-well Warfield pool of The Texas Co.

The Warfield well, the 1 Scharbauer, is the nearest producer, and was completed in the Ellenburger at 13,049-150 ft. At completion time the 1 Scharbauer made 39 bbl. of oil per day and about 6 bbl. of water.

High on structure.—The 2 Parks is 117 ft. higher on the Ellenburger than the 1 Scharbauer. It encountered the Ellenburger a little higher than did the General American Oil Co. 1 Peck, and nearly 400 ft. lower than did Magnolia's 1-B TXL in Pegasus field.

The accompanying table shows the tops of deep Ellenburger discovery wells in Midland County. Since the tops were called by different geologists, the correlation may not be exact but indicates the general relationship of the four fields.

The new Parks well is similar to Pegasus and Peck fields in several respects—depth, drilling conditions, large number of pays, and kind and amount of oil produced from the Ellenburger. The areal extent of Peck and Pegasus fields has not been determined exactly because of the limited number of completed wells. Extensive seismic work indicates that these two fields are on separate anticlinal structures *(The Oil and Gas Journal, April 27, page 140)*.

The Parks test was spudded January 3, 1950, and casing was being run for final completion early this week. Drilling time for this well was considerably less than for the first well in Pegasus field—49 weeks.

Like Pegasus.—Drill-stem tests in 2 Parks also have indicated a structure similar to the Pegasus and Peck fields.

A drill-stem test in the Wolfcamp, probably in the top of that section, from 9,525-9,600 ft., had gas at the surface in 14 minutes, rated at 9,620 cu. ft. a day, and recovered 670 ft. of oil and gas-cut mud.

On a drill-stem test in the Pennsylvanian, the Parks discovery flowed 44.6°-gravity oil, gaged at 23.38 bbl. of oil in 2 hours. This test was run from 10,398-10,468 ft., after topping the formation at 10,060 ft. Top of the Pennsylvanian pay was placed at 10,400 ft., and of the 40 ft. of gross pay indicated, operators believed there was 10-15 ft. of net pay.

Drill-stem test in the Ellenburger from 12,944-70 ft., open 1 hour and 24 minutes, was through ⅝ and 1-in. chokes, with no water cushion. Gas surfaced in 7 minutes, mud in 19, and oil in 22 minutes. It flowed into pits for 2 minutes, then gaged 124 bbl. of 53°-gravity oil in 1 hour, with gas-oil ratio of 1,042 ft. Surface flowing pressure ranged from 390-365 psi., and bottom-hole flowing pressure was 4,700-4,170 psi. After shut in 15 minutes, bottom-hole pressure built up to 5,565 psi. At last report operators were running 5½-in. casing for completion tests.

On the above test, after the well had cleaned into pits and was connected to storage, it flowed 30.94 bbl. of oil the first 15 minutes, 29.52 bbl. of oil the second like period, 32.31 bbl. third quarter hour, and 30.94 bbl. the last 15 minutes.

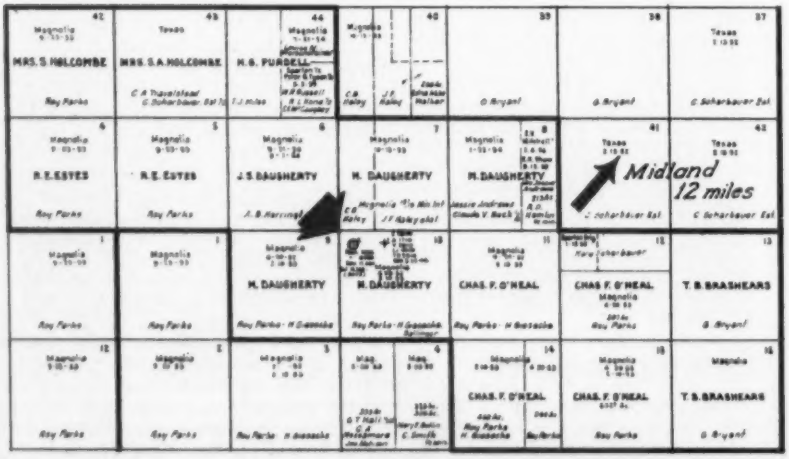
The 2 Parks was thought to be about 250 ft. above the water table as found in The Texas Co. 1 Scharbauer. The Parks well cored from 12,920-70 ft., recovering 48 ft., which was 20 ft. of lime and shale of Simpson age, 15 ft. of Joins dolomite, and the bottom 15 ft., (12,955-70 ft.), was Ellenburger dolomite, very porous and having good stain and odor. The drill-stem test also proved it to be a very rich pay section.

DEEP ELLENBURGER WELLS IN MIDLAND COUNTY

(All depths are subsea.)

Formation—	Texas Co. 1 Scharbauer (elev. +2,823)	Magnolia Pet. 2 Parks (elev. +2,835)	Gen. American 1 Peck (elev. +2,902)	Magnolia Pet. 1-B TXL (elev. +2,882)
Anhydrite	+ 1,133	+ 1,115	+ 1,011	+ 1,114
Sprayberry	.....	— 4,960	— 4,866	— 4,699
Pennsylvanian	— 6,977	— 7,225	— 7,106	— 7,077
Woodford	.....	— 8,648	— 8,521	— 8,177
Devonian	.....	— 8,725	— 8,650	— 8,297
Silurian	— 9,562	— 9,426	— 9,510	— 8,999
Fusselman	.....	— 9,565	— 9,562	— 9,048
Ellenburger	—10,237	—10,120	—10,196	— 9,667
Total depth	—10,551°	—10,135	—10,497	—10,113

°Drilled out total depth.



Ownership map of part of Midland County, Texas, showing location of Magnolia's acreage and the discovery well, the 2 Roy Parks. Courtesy of Southwest Mapping Co., Fort Worth.

Allowables Raised

Fourth Texas boost gives July 2,445,935 bbl. daily

AUSTIN.—For the fourth consecutive month the Texas Railroad Commission has granted an increase in production allowables.

July's permissive flow calls for an increase of 66,706 bbl. daily, to a total of 2,445,935 bbl., and was brought about by the increasing number of producing days from the 19 permitted in June to 21, except for East Texas field which remains at the 19-day level.

Along with the granting of an overall production increase for the state, the commission took away special allowables given after the April hearing to producers of special low-cold-test, lube-type crudes. The special allowable was granted by the commission to forestall a threat of imports of this crude from Latin American sources. Since most of the fields that produce this crude are located along the Gulf Coast, the allowable July production for that district was decreased. The special allowable amounted to 24,000 bbl. daily and with it taken away, the net result on Commission District 3 (the Gulf Coast) production was a decrease of 4,854 bbl. daily.

East Texas field was kept at the 19-day level because testimony at the hearing indicated that pressures were dropping and it was feared than an increase in producing days would result in physical waste by causing pressures to drop too rapidly.

To raise stocks.—The increase was granted to build national crude stocks to what was described by major company heads at a hearing last month as the minimum safe level for crude storage—240,000,000 bbl. Current statistics show crude levels to be standing at 239,464,000 bbl. Commissioner Ernest O. Thompson urged that stock levels be kept above the minimum, and said "If we should have a shortage come winter it would be a gross error on the part of this regulatory body."

Representatives of Humble Oil & Refining Co. and Magnolia Petroleum Co. advised caution in advancing the number of producing days. Humble thought 1 day increase would be sufficient and Magnolia thought that the June level was satisfactory. Other purchasers recommended the 2-day increase that was later granted.

The commission has estimated that during July production of natural gasoline and distillate would amount to 306,610 bbl. daily, making the total state allowable production 2,752,545 bbl. daily. This total compares with a 2,190,000 bbl. average forecast by the Bureau of Mines as being the July demand for Texas crude.

Gas Ratio May Be Cut

AUSTIN. — The Texas Railroad Commission at its next proration hearing July 14 in Austin will hear evidence or testimony on a proposed order to reduce the state-wide permissible gas-oil ratio. The proposal would halve the present maximum from 2,000 cu. ft. per barrel to 1,000 cu. ft. per barrel.

Intense opposition to the change will probably be encountered by the commission, since an order of this kind will cut oil production from hundreds of wells by one-half. In effect it will penalize the older fields that have passed the bubble point and have high producing G.O.R.'s. By reducing production in these fields, the newer, more efficient fields will produce a greater share of the state's allowable.

A result of the proposed order will be to force institution of secondary-recovery practices much earlier in the life of a field than is now practiced. Pressure-maintenance practices will become a must in many fields where they are not now used, particularly in those where a water drive is not exceptionally active. And since the order will probably include a provision whereby production, limited by G.O.R., may be raised by returning part of the produced gas to the reservoir, the number of cycling plants is probably due for an increase.

The order will also reduce the amount of casing-head gas available to transmission lines. According to March figures, casing-head gas represented about one-fifth of the gas produced in Texas. This figure would certainly be reduced by such an order.

ALLOWABLES BY DISTRICTS
(Barrels daily)

District	July 1	June 10	Changes
1 (Southwest)	31,014	30,283	+ 731
2 (Southwest)	141,301	132,898	+ 8,403
3 (Gulf Coast)	422,119	426,943	— 4,854
4 (Southwest)	228,495	217,727	+10,768
5 (Eastern)	37,243	35,110	+ 2,133
6 (Out. E. Texas field)	98,466	93,502	+ 4,964
East Texas field	277,521	286,310	— 8,789
7B (Central)	83,712	81,310	+ 2,402
7C (West)	58,430	56,074	+ 2,356
8 (West)	768,763	724,962	+43,801
9 (North)	189,357	184,579	+ 4,778
10 (Panhandle)	109,514	109,501	+ 13
Totals	2,445,935	2,379,229	+66,706

Dry Drilling

Shot holes drilled with air avoid need for water

Roy F. Carlson

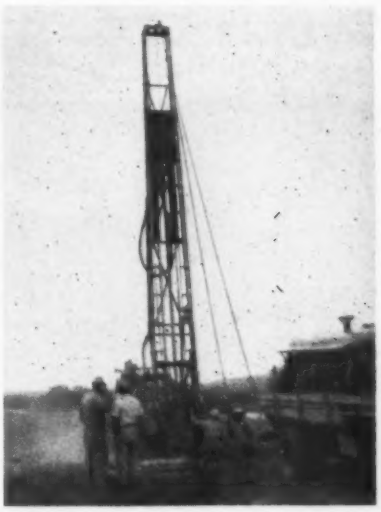
DALLAS.—The water truck will soon disappear from the scene of Permian basin shot-hole drilling operations if tests now being conducted with portable air compressors prove as successful in all areas as preliminary work would indicate.

And along with the water truck will go the long water hauls that are a matter of course in West Texas geophysical operations. It is entirely possible that a succession of shot holes may be drilled with one passage along the shot line of one vehicle—a drill truck equipped with an air compressor.

In this drilling-with-air technique a stream of air is circulated through the drill pipe as is mud in conventional drilling. The air is supplied by a portable truck-mounted compressor as shown in the accompanying photograph. The compressor discharges into a volume tank and then into the standpipe and rotary hose.

Blind or lost-circulation holes are not the problem they have been in water drilling, because air is free, always at the location, present in unlimited quantities, and available for use again and again. The repeated 5, 10, 20, or even 40-mile trips for the water required for conventional drilling with mud are eliminated in this new drilling technique. Waiting on the water truck is also eliminated. And the rancher is happier when his grass is left nearly intact because travel over the shot-line trails is kept to a minimum.

Drilling speed will apparently be



The cloud of dust rising from around the drill pipe marks this as an air-drilling operation. Rig and equipment belong to Geotechnical Corp. of Dallas and is on location in West Texas.

increased by application of air to the shot-hole operation. More weight can be kept on the bit, faster drilling bits can be used with air than with water, and bits themselves last longer when air is being circulated than when water is being used.

Bit life, too, will probably be increased according to preliminary information. This can be attributed to the fact that no part of the cuttings is recirculated, so that sand and grit are kept out of the bearings. Also, with the increased weight and stiffer drill pipe, the bit is kept squarely and solidly on the bottom of the hole so that chattering and bouncing of the bit is stopped.

GULF COAST

Offshore Pipe Line

Marine Gathering Co. to lay 9-mile natural-gas line into Gulf off Louisiana to tap Pure's gas reserves

Leigh S. McCaslin, Jr.

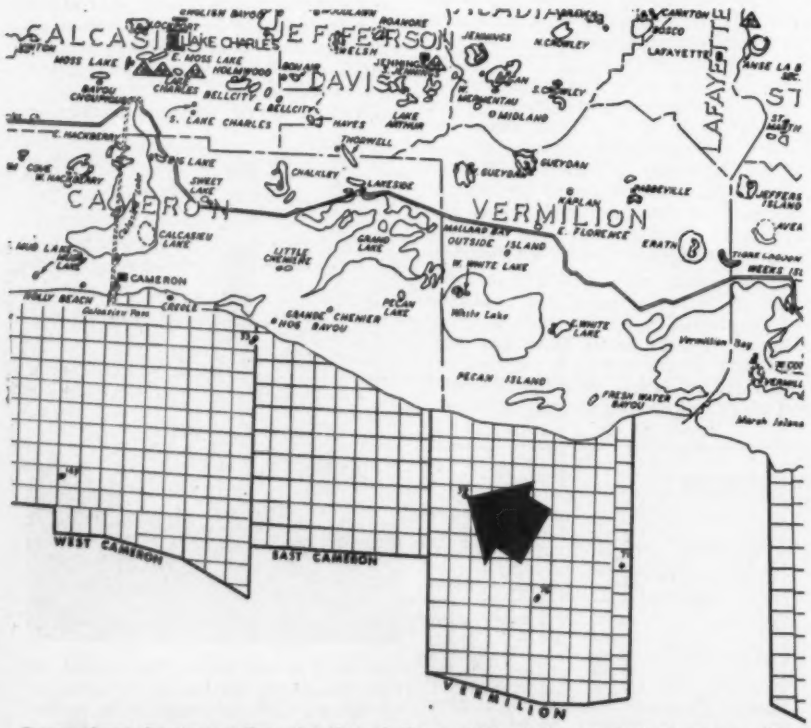
HOUSTON.—A contract will be awarded this week for construction of the first offshore gas pipe line in the tidelands waters of the Gulf.

Marine Gathering Co., a newly formed corporation, is going to lay an 8⅝-in. line out into the open and unprotected Gulf waters. The line will tie into gas reserves developed by Pure Oil Co. and will deliver gas to the land system of Tennessee Gas Transmission Co. It extends from the coastline of Vermilion Parish, Louisiana, 9 miles into the Gulf to Pure's drilling platform above the Rollover field, which is in 36 ft. of water.

Shell Oil Co. pioneered offshore pipe lines in the Gulf a year ago when it laid 3 miles of 4-in. line to gather crude from Bay Marchand field, which lies offshore of Lafourche Parish, Louisiana, and is about 60 miles south of New Orleans.

Marine Gathering's new gas line will have a daily delivery capacity of 50,000,000 cu. ft. A plant will be erected on the mainland to remove liquid hydrocarbons from the gas and to dehydrate it before delivery to the Tennessee Gas system.

John H. Blaffer, president of Commerce Oil Co., Houston, is president of the new firm. G. Burton Liese, Houston investment banker, and Philip C. Dixon, Tulsa, are vice presidents. The three own the company and constitute the board of directors.



Arrow shows location of Pure Oil Co.'s Rollover field off the coast of Louisiana which will be connected to the shore with a submarine gas pipe line.

Robert C. Ledford, former superintendent of the McCarthy Chemical Co. plant at Winnie, Tex., will be the operating manager for Marine Gathering. Headquarters for the company have been opened in the Oil & Gas Building here.

Use steel pipe.—Blaffer says that steel pipe of special specifications will be used for the project. The pipe will be given special treatment, including coating and wrapping, for protection from the salt water. It will be buried in the ocean bottom through the use of a new jet process of underwater ditching.

Although company officials decline to comment, it is believed that the jet process is the same as is being used by Transcontinental Gas Pipe Line Corp. in a crossing of the Hudson River between New Jersey and Manhattan Island. The process involves the use of air and water jets and was worked out by Transcontinental in collaboration with Louis Pentzien of Omaha Dredge & Dock Co. A small-diameter jet pipe having specially designed slots is clamped on the underwater side of the pipe. It is connected to water and air supplies on barges on the water surface through special hoses.

Control of the jetting operation is handled by the use of special automatic valves spaced uniformly along the length of the jet pipe. After the pipe is pulled into place and laid on the bottom, the jetting operations are carried on uniformly back and forth until the entire line is down to the desired depth below the bottom.

Proven reserves.—Pure Oil Co. has had proven reserves in the Rollover field for approximately 2 years, but the field has been shut in for lack of market. There is only one well in the field at present, but the company will start further development in the immediate future to assure Marine Gathering an adequate gas supply. Locations have not yet been selected for the development wells. From reservoir information gained with the drilling of the discovery well, the company is certain of the presence of an excellent gas reservoir.

The discovery well of Rollover field is located on State Lease 880, Block 39, Vermilion area. It was plugged after discovery, and Pure will go back in and ready it for production within the next few weeks. The company has 22,500 acres under lease in the vicinity of the field. Pure has offshore oil and gas-distillate production in the Block 32 field, Eugene Island area, off St. Mary Parish, Louisiana. There are two oil wells and one gas-distillate producer in the field, and development is continuing.

Pure is well-known for the economy and good engineering of its offshore drilling operations. It has a self-propelled L.S.T., the only one in the Gulf, which it utilizes in conjunction with a piling platform.

Penn Grade Meeting

Research progress points to many new improvements in techniques of secondary-recovery from old oil fields

PITTSBURGH.—Progress in secondary-recovery research and problems of marketing quality lubricating oils here and abroad were the chief topics discussed at the annual convention of the Pennsylvania Grade Crude Oil Association here June 15-16.

Producers and refiners of the Penn Grade area heard reelected President Clarendon E. Streeter warn that while conditions are currently satisfactory, the available reserves are being depleted because of the small number of wells drilled in the area during the last year and a half.

"This slackening of drilling rate is due to the high cost of material and labor in relation to the present market price for Pennsylvania crude," Streeter declared.

Other adverse factors facing the Appalachian operators, Streeter pointed out, were the sterling-group dollar restrictions and the threat of competition from excess refining capacity built in Europe by ECA.

Another discouraging issue brought out at the annual meeting was the observance of the increasing trend among engine manufacturers to use Army specification (2-104B) oil. This was made by Dr. Merrell R. Fenske, director of the petroleum refining laboratory at Pennsylvania State College, who stated that groups other than oil men will set the quality pattern under the specification plan.

"It is up to the industry to decide if it wants this arrangement," Fenske asserted.

Dr. James Boyd, director of the U. S. Bureau of Mines, praised the quality of Pennsylvania Grade crude as containing about 9 gal. of lube stock to the barrel compared with the national average of less than a gallon. He pointed out that it can be refined by simple processes if present refineries should be destroyed in time of war.

Research.—A bright note at the meeting was a report on the research program conducted under the sponsorship of the association in which several conclusions have been reached in secondary-recovery studies. These were presented by H. G. Botset, professor of petroleum engineering at Pittsburgh University and technical adviser to the association. Among the conclusions which are indicated by the research to date are:

1. For low-permeability sands, higher pressure gradients should give more effective recovery for the same total water input.

2. In a single sand, a larger fraction of the oil recovered was obtained water-free at higher pressure gradients.

3. That pore size distribution is a greater factor in the effectiveness of recovery than permeability.

4. That a high gas concentration in the sand ahead of a water flood will have a beneficial effect on oil recovery.

5. No one inhibitor will solve corrosion problems under all conditions, but each water should probably be tested with several inhibitors to find the right one.

6. That permanent changes in the water permeability of a sand can be induced by the use of hot water (up to 235° F. and under moderate pressures). While the hot water is flowing, permeability may be increased or decreased but on cooling, the cold-water permeability usually remains considerably higher than the original.

7. Pronounced directional permeability exists in core samples of producing sands in the Pennsylvania area, with these studies to be expanded to include Kansas and Oklahoma sands.

8. Development of a new type of shielded electrode for use in electric logging for application where beds are very thin and sharp definition is needed.

Officers.—In addition to Streeter's reelection, the board of directors elected the following officers at the convention: These included three new directors: C. F. Felton, Franklin Refinery, L. Sonneborn Sons, Inc.; G. H. Osborne, Kendall Refining Co.; and James A. Upham, an independent oil producer and president of the Ohio Oil and Gas Association. Other officers are: J. D. Berry, Jr., "D" Oil Co., first vice president; G. J. Hanks, South Penn Oil Co., second vice president; Fayette B. Dow, Washington, vice president and general counsel; Samuel Messer, Quaker State Oil Refining Corp., Oil City, treasurer; W. R. Reitz, Quaker State Oil Refining Corp., C. L. Suhr, and F. W. Alcorn, both of The Pennzoil Co., Oil City, assistant treasurers; and W. C. Wenzel, Oil City, executive manager.

Two men who helped found the Pennsylvania Grade Crude Oil Association 27 years ago are shown at the annual meeting in Pittsburgh. They are E. C. Breene, left, and C. L. Suhr.

Officials of the Pennsylvania Grade Crude Oil Association are shown in a discussion before the opening of the twenty-seventh annual meeting of the association in Pittsburgh, June 15-16. Left to right: C. E. Streeter, Bradford, oil producer; H. G. Botset, professor of petroleum engineering at the University of Pittsburgh and technical adviser to the association; W. C. Wenzel, Oil City, executive manager of the group; and W. S. Zehrung, Oil City, president of Pennzoil Co. and a director of the association.

XUM

Gas for Carolinas

Three firms vie for right to build pipe-line systems

WASHINGTON. — Three companies have filed applications with the Federal Power Commission here for permit to construct natural-gas pipeline systems to serve North and South Carolina, and another firm has requested commission approval to enlarge its system in order to supply gas to the successful candidate.

The firms are: Public Service Co. of North Carolina, Inc.; Carolina Natural Gas Corp.; and Piedmont Natural Gas Co. Transcontinental Gas Pipe Line Corp. is seeking to enlarge its compressor capacity to furnish gas for Public Service and Piedmont, and Carolina Natural has requested that FPC order Transcontinental to furnish its proposed project with necessary gas requirements.

The companies' plans are as follows:

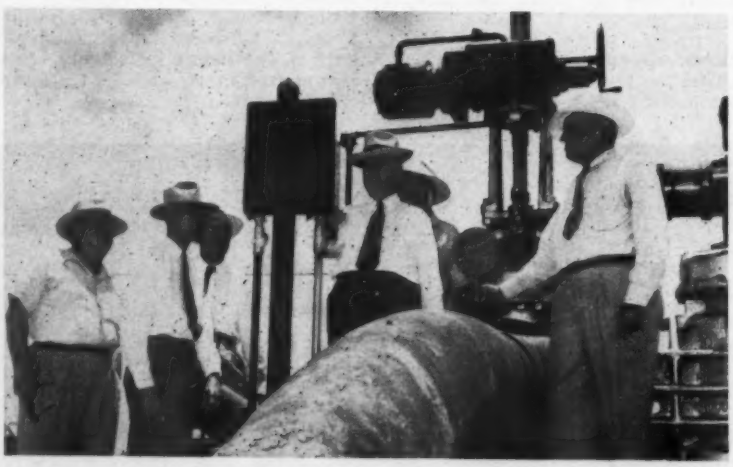
Public Service Co.—Construction of a 365-mile system to serve 39 North and South Carolina areas, at a cost estimated at $7,046,000. System would connect at 10 points with Transcontinental's Texas-to-New York City gas line. The company also seeks an FPC order directing Transcontinental to connect its facilities with the proposed line, and to deliver the required amounts of natural gas to it. Estimated requirements range from 6,100,000,000 cu. ft. annually with a peak day of 24,000,000 cu. ft. for the first year, to 21,200,000,000 cu. ft. annually and a peak day of 97,000,000 cu. ft. in the fifth year.

Carolina Natural.—Seeks authority to construct 375 miles of laterals extending from Transcontinental's main line to various markets in the two states, at an estimated cost of $7,374,100. Also, the firm seeks an order directing FPC to order Transcontinental to supply the gas.

Piedmont.—Seeks to build and operate six short laterals, totaling about 74 miles of line, at a cost of $1,200,000. These lines would extend from Transcontinental's main line, to city gas-distribution systems. The firm has a contract to purchase gas plants and distribution systems of Duke Power Co. in a number of towns. Piedmont also has contract with Transcontinental for gas ranging from 5,000,000 cu. ft. daily during the first 3 years of service, up to 22,000,000 cu. ft. daily the third year and thereafter.

Transcontinental's proposal. — Transcontinental on June 13 applied to FPC for authorization to install a total of 33,600 hp. additional at authorized compressor stations on its Texas-to-New York City line, in order to supply the gas which Piedmont and Public Service Co. of North Carolina need for their proposed lines. (Carolina Natural Gas Corp., the third contender for service in the area, has already asked FPC to order Transcontinental to supply its proposed system).

Transcontinental's application seeks authority to sell and deliver gas to Piedmont, and also to Public Service Co. Estimated cost of Transcontinental's proposed additional facilities is $5,339,400.



FIRST FLOW.—R. V. Hanrahan, president, Humble Pipe Line Co., pushes the button allowing the first oil to flow to storage from Humble's new pipe line from West Texas to Houston. The new 18-in., 370-mile line runs from Kemper to Satsuma, 20 miles north of Houston. A detailed article discussing the project will appear in next week's Oil and Gas Journal. Watching Hanrahan in the picture are: H. C. Evans, Tomball district superintendent; W. S. Spangler, assistant superintendent, southern division; O. Q. Lomax, vice president; Hanrahan; H. H. Hetzler, chief engineer, Satsuma station; and A. E. Payne, superintendent, southern division.

NORTHWEST

Radioactive Line

Salt Lake products line batching with tracers

BOISE, Idaho.—A product of atomic energy is controlling the operations of a products pipe line now serving Boise.

The line is part of the 566-mile, 8-in. line being constructed from Salt Lake City to Pasco, Wash., on the Columbia River, being built by Salt Lake Pipe Line Co., a subsidiary of Standard Oil Co. of California. It has been operating as far as Twin Falls since January, began pumping to Boise last week, and is scheduled for completion in August.

So far as is known, this is the first commercial use of radioactive materials in an oil pipe line. The material, produced by the Atomic Energy Commission at Oak Ridge, Tenn., is a tracer element injected into the stream to mark the ends of batches of different products being pumped.

The use of the tracer was described by H. R. Cuyler, general sales manager of the Standard company, at ceremonies opening service to Boise.

How it works.—"It involves the use of a chemical tracer material which has been exposed to radiation bombardment in an atomic pile," he said. "The radioactive material, diluted by thousands of times its volume of oil, becomes a tracer liquid, and this is the form in which it is used in the pipe line.

"Each time the Salt Lake pump station changes the product being pumped through the line, a fraction of an ounce of diluted tracer liquid is added to the oil stream between the two products. As the junction of the two products moves along the line, the tracer moves with it. At each point where products are delivered sensitive instruments, using Geiger counters attached to the pipe, respond to the arrival of the tracer. From these instruments, the operators know when one product has completed its arrival, and when to change the stream to another tank."

Cuyler said that the radioactive material is "absolutely safe," and stated that the amount of radiation present is much less than that occurring in many articles used in our daily life.

"For example, it is less even than the radioactivity of a luminous watch dial," he said, "and by the time the products appear in tankage, the tracer is so dilute that it can be detected only with the most delicate instruments. The material used is self-destroying, and its radioactivity falls off rapidly with time."

New Lube Classification

Cold-climate grades, low-temperature test, included in revised schedule now up for final S. A. E. approval

George Weber

NEW YORK. — A new, simplified viscosity classification for crankcase lubricating oils is now in the final stage of official approval.

The new list drops some heavy grades and adds some light ones, and it will require refiners to show viscosity at 0° F.

The changes have been under deliberation for months by representatives of the petroleum and automotive industries, but agreement has just been reached by a committee of the Society of Automotive Engineers. Final acceptance by the S.A.E. technical board is considered practically certain.

The new classification lists seven viscosity grades, the same number as the present one. However, it incorporates three new winter grades, dropping one light and two heavy viscosity classifications. Thus it incorporates two "W" grades formerly listed on a separate Automotive Manufacturers' Viscosity Classification, and a third, 5W grade never before officially recognized.

The proposed new classification is shown in Table 1, and the present classification is given in Table 2.

At the annual summer meeting of the Society of Automotive Engineers, members of subcommittee "B" on engine lubricants, of the society's fuels and lubricants technical committee, resolved their differences and recommended a simplified classification to the parent committee. The technical committee in turn agreed on some additional changes and approved it almost unanimously.

TABLE 1 — PROPOSED NEW CLASSIFICATION

S.A.E. Vis. No.	Viscosity range, Saybolt Universal, seconds 0° F. Min.	0° F. Max.	210° F. Min.	210° F. Max. (less than)
5W	..	4,000	..	..
10W	*6,000	12,000	..	..
20W	†12,000	48,000	..	..
20	.....	.....	45	58
30	.....	.....	58	70
40	.....	.....	70	85
50	.....	.....	85	110

*Minimum viscosity at 0° F. can be waived provided viscosity at 210° F. is not below 40 Saybolt Seconds Universal. †Minimum viscosity at 0° F. can be waived provided viscosity at 210° F. is not below 45 Saybolt Seconds Universal.

TABLE 2—PRESENT S.A.E. CLASSIFICATION

S.A.E. Vis. No.	Viscosity, range, Saybolt, Universal seconds 130° F. Min.	130° F. Max.	210° F. Min.	210° F. Max.
10	90	120	...	...
20	120	185	...	...
30	185	255	...	...
40	255	...	...	80
50	...	...	80	105
60	...	...	105	125
70	...	...	125	150

Official statement.—In approving the new classification, the committee said:

"The S.A.E. viscosity numbers constitute a classification for crankcase lubricating oils in terms of viscosity only. Viscosity numbers without an additional symbol are based on the viscosity at 210° F. Viscosity numbers with the additional symbol W are based on the viscosity at 0° F. The viscosity of oils for use in crankcases shall not be less than 39 S.U.v. at 210° F. for oils considered in this classification. Other factors of oil character or quality are not considered.

"In the case of prediluted oils, S.A.E. viscosity numbers by which the oils are classified shall be determined by the viscosity of the undiluted oils.

"Whenever the S.A.E. viscosity numbers are used on prediluted oils, the container labels should show in some suitable manner that the S.A.E. number applies to undiluted oil."

The reference to prediluted oils pertains to the present practice of adding kerosine to a heavier oil to obtain a lubricant suitable for extremely cold weather, resulting in an oil somewhat comparable to the new 5W.

Approval expected.—The new recommendation is now undergoing a mail ballot by the fuels and lubricants technical committee. It will then be submitted to the S.A.E. technical board which will make it duly official, provided no major company or group in either industry raises serious objection. In view of the wide participation of all important members of each industry in the drafting of the present resolution, such a possibility is highly doubtful.

The 5W classification came as a surprise to many. It was not considered in earlier classification discussions. Deletion of the two heaviest grades in the previous classification on the other hand, was a foregone conclusion. As compared with the present classification, the new system incorporates several improvements, although it lists more grades than some oil company representatives would have liked.

The separate Automotive Manufacturers' Viscosity Classification lists two winter grades: No. 10W, from 6,000 to 12,000 S.U.v. at 0° F., and 20W, from 12,000 to 48,000 S.U.v. at 0° F. These are now incorporated unchanged in the S.A.E. recommended list. The 5W grade which has ranged around 3,200 S.U.v. at 0° F. will also become an official S.A.E. grade.

Assuming favorable action by the S.A.E. technical board, the new classification will be listed in the society's 1951 handbook. Officially, 18 months must elapse after final board approval before such changes are effective in the field, although that period may be shortened by official action.

Octane Complaint

Octane race uneconomic, wasteful Doolittle says

DETROIT. — A halt to the octane race until technological progress makes high-octane fuels available at low cost was called for by James H. Doolittle, vice president of Shell Oil Co., addressing the lubricants committee of the American Petroleum Institute here last week.

Should there be a wide usage of engines with very-high-compression ratios the oil industry could supply the fuel but it would be very costly and would so "skim the cream" off a barrel of crude that the rest of the products would be very low in value," he said.

"The problem of higher octane number is not one of not having the know-how to make them," Doolittle said. "We have made sizable runs of a fuel with 150 lean rating and 200 rich rating. Such a fuel is extremely costly to produce and robs the residuum of much of its economic usefulness. The problem is to be able to obtain sufficient quantities of higher-octane materials from the crude without extreme and exhorbitant waste, and at a cost which will make the use of these fuels economically feasible.

"In other words, if the octane requirements are sharply increased, the total volume of readily salable products from a given amount of crude will be less, and the waste proportionately greater.

"When the increased cost of gasoline is relatively greater than the increased efficiency which the motor can obtain through its use, we are guilty of economic waste, and through this economic waste we are reducing the usefulness and value of motor vehicles as a whole.

"In the future we will have much

more powerful engines and probably much better fuels which will result in greater efficiency and performance than we know today, and they will be obtained on a basis which will be economically feasible to the average motorist.

"But the first logical step toward the achievement of that goal, and one which will make its attainment easier and more practical, is for the petroleum and automotive industries to work together now to increase the efficiency of the conventional Otto cycle engine operating on today's premium grade economical fuels."

Octane Record

Bureau says numbers last winter highest on record

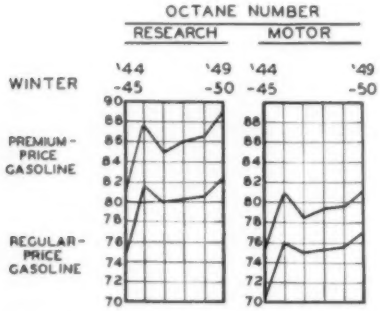
BARTLESVILLE, Okla. — Octane numbers of motor gasoline sold in filling stations in the United States during the past winter were the highest on record, the U. S. Bureau of Mines reported here last week.

Compilations of data from the semi-annual survey by the bureau, in cooperation with the American Petroleum Institute, indicate that average octane ratings of motor fuels throughout the country have increased over those of fuels sold in the summer of 1949, and are 1½ to 2½ numbers higher than those of gasolines sold during the preceding winter.

The national average octane values by the research and motor methods for these surveys are:

	Research O.N.	Motor O.N.
Premium-price gasoline—		
Winter 1949-50	89.0	81.2
Summer, 1949	88.0	80.4
Winter 1948-49	86.5	79.7
Regular-price gasoline—		
Winter 1949-50	82.4	77.1
Summer 1949	81.9	76.4
Winter 1948-49	80.5	75.6

Tests of this winter's fuel vapor pressures and distillation characteristics indicate a slight trend toward more volatile gasolines, the bureau reported. Average Reid vapor pressures are 10.5 and 10.4 lb. for premium and regular-price gasolines.



Trend in octane numbers on premium and regular-price gasolines is shown on the above chart.

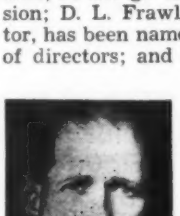
Merger Is Approved

Stockholders of Sunray Oil Corp., Barnsdall Oil Co. approve consolidation by big majority

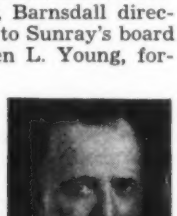
NEW YORK.—Stockholders of Sunray Oil Corp. and Barnsdall Oil Co. approved merger of the two companies at annual meetings held here this week, and the consolidation will become effective when the agreement is recorded, as required by the general corporation laws of Delaware.

Three former officers and directors of Barnsdall have been named to Sunray's board of directors, and Barnsdall's treasurer has become assistant treasurer of Sunray.

Dale R. Snow, Tulsa, vice president and general manager of Barnsdall's Mid-Continent division, becomes vice president of exploration and production; W. C. Whaley, vice president and general manager of Barnsdall's California division, becomes vice president, in charge of the California division; D. L. Frawley, Barnsdall director, has been named to Sunray's board of directors; and Ben L. Young, formerly treasurer of Barnsdall, becomes Sunray's assistant treasurer.



D. R. SNOW



W. C. WHALEY

At Sunray's board meeting, F. B. Parriott, chairman of the board, was reelected to that position; C. H. Wright, director and president, was reelected to that post; and all other officers and directors were reelected.

High percentage approve. — Of the total vote by holders of Sunray's common and preferred stock, 76.7 per cent voted in favor of the merger. A total of 79.4 per cent of Barnsdall's stockholders were in approval of the consolidation.

Also approved by Sunray's stockholders was continuation of the amended existing pension plan of Barnsdall, and extension of its benefits to employes of Sunray.

This action by stockholders of the two companies culminates the necessary legal steps in final merger which began last February.

Sunray gained control of Barnsdall in February when its directors approved a transaction, negotiated by Wright, to purchase approximately 800,000 shares of Barnsdall common stock for $56 per share from Floyd B. Odlum and the investment companies he controls, Atlas Corp., and Ogden Corp. *(The Oil and Gas Journal, February 16, 1950, page 77).*

Sunray paid $44,000,000 in cash the latter part of February, the money obtained from company funds and partly from short-term commercial bank loans from Eastman, Dillon & Co., Sunray's bankers, and Guaranty Trust Co. of New York.

Barnsdall previously had a policy of buying its own stock, which resulted in the retirement of 518,407 shares during 1949 and through February 1950. This purchase program was stopped, however, when Sunray purchased the 800,000 shares from Odlum.

To consolidate offices. — Sunray will move this summer into new offices in the First National Bank & Trust Co. Building in Tulsa, at which time all Barnsdall personnel retained by Sunray will leave offices in Tulsa's Petroleum Building and consolidate with the Sunray organization.

No plans have been announced as to how many Barnsdall employes Sunray will absorb, but it is understood that the firm will retain as many as possible.

MID-CONTINENT

Stanolind to Transfer 400

TULSA.—Stanolind Oil & Gas Co. will transfer approximately 400 employes from the firm's general offices here to four division offices, E. F. Bullard, president, announced.

Moves involving any large groups will not begin before June 1951, however, and will not be completed until a year later, Bullard said. Nearly all affected are members of the accounting department.

The company earlier announced transfer to division offices of 125 employes, most of whom were in the rental and records section of the land department.

"These transfers will complete our decentralization program," Bullard said. "With each succeeding year our operations have become more complex and it has been increasingly difficult to direct our activities from one central office.

"As a result, several years ago we began decentralizing many producing and exploration functions. The present moves are a continuation of this program."

A major number of the employes will be moved to Oklahoma City, and others will go to Houston, Fort Worth, and Casper, Wyo.

Barnsdall Sells Rigs

Frank Frawley, former drilling-department manager, buys all drilling equipment, forms new organization

TULSA.—Barnsdall Oil Co., now in the process of merging with Sunray Oil Corp., has sold its entire drilling department to Frank Frawley, who has served as manager of the department the past 2 years.

FRANK FRAWLEY

Price of the facilities was not disclosed, but the transaction included 4 rotary rigs, 25,000 ft. of new drill pipe, 3 trucks, 10 automobiles, and other drilling machinery and equipment used by Barnsdall.

Frawley has organized the Frank Frawley Drilling Co., an Oklahoma corporation, and will serve as president and general manager. T. A. Carroll, formerly chief clerk of Barnsdall's drilling department, will serve as assistant secretary, and Tom Cline will serve as chief drilling superintendent.

The Barnsdall - Hayward offshore drilling rig and barge, which reportedly cost more than $1,000,000, was not included in the sale. It will be retained by the company for use in the Gulf of Mexico, where it is now drilling.

Office facilities and storage yards at Oklahoma City and Shreveport were included in the sale, as well as temporary yard facilities at Snyder, Tex. Main headquarters of Frawley Drilling Co. will remain in Tulsa.

Organized in 1944.—Barnsdall organized its drilling department in 1944. The company at that time had a total of 10 rigs operating in the Rocky Mountain, Mid-Continent, and Pacific Coast regions. Barnsdall later sold three of the rigs, which were then in Wyoming, and at a later date sold three more rigs to the newly organized B.B.M. Drilling Co., Houston.

The Barnsdall organization was planning to keep the four rigs which were sold to Frawley as a nucleus to handle any increased drilling the company might have in the future. However, when the decision was made to merge the firm with Sunray, it was decided that, inasmuch as Sunray used only contract drillers, all equipment would be sold, and the drilling department liquidated.

Already active.—Frawley said his new company is already active in West Texas and in the Golden Trend area of southwestern Oklahoma. Two Emsco rotaries rated at 9,000-ft. capacity are drilling in Scurry County, Texas; a National 100 rotary, rated at 10,000-ft. capacity, is now in operation in Borden County, Texas; and an Ideco "Big-Giant" steam rig, with a capacity of 12,000 ft., is located at Lindsay, Okla.

"We plan to offer our services anywhere in the United States," Frawley said, but indicated that his rigs would not operate in Canada.

"At the present time we do not plan on adding any more major equipment to our facilities," he said, but added that when more equipment is needed it would be acquired.

Personnel retained.—Frawley retained all personnel in the Barnsdall drilling department and has a total of 60 employes.

In addition to Carroll and Frawley in the Tulsa offices, Miss Pat McHenry is serving as secretary to Frawley. Roy Owen is serving as tool pusher at Snyder, Tex., and W. P. (Buster) Bishop is tool pusher at Big Spring, Tex. Tom Cline, Frawley's chief drilling superintendent, is now on temporary loan to Barnsdall where he is supervising drilling of a 14,000-ft. test in Ellis County, Oklahoma.

Frawley joined Barnsdall in 1925, and worked as a roustabout, well puller, and roughneck. He spent a total of 10 years in the production department, then transferred to the refining and marketing divisions, working in Chicago. He also served the company in Ohio, Michigan, and Indiana, and in 1938 was transferred to Texas. He moved to Tulsa in 1940, and when the drilling department was organized in 1944 was named assistant manager. He became the department's manager in 1948.

He is a member of the Independent Petroleum Association of America.

This is one of four rotary rigs which Barnsdall Oil Co., Tulsa, has sold to Frank Frawley, manager of the company's drilling department. Frawley purchased all Barnsdall drilling equipment except an offshore drilling rig and barge, and has formed a new drilling-contracting company.

Joins Journal

P. C. Ingalls formerly was Carter Oil geologist

PHILIP C. INGALLS, reserve geologist for Carter Oil Co., Tulsa, has been appointed associate editor of The Oil and Gas Journal, in charge of the exploration department.

Head of the reserve section at Carter since June 1949, Ingalls previously had been engaged in geological work for the company and Creole Petroleum Corp. for several years.

PHILIP C. INGALLS

He received a bachelor of science degree in geology in February 1939 from the University of Michigan. While attending the university he worked as a roustabout during the summer months in Kansas fields, and was employed for a time by Great Lakes Pipe Line Co. at its Kansas City terminal. He attended the University of Michigan's geological field camps in Colorado and Wyoming.

Following graduation, Ingalls joined Seismograph Service Corp. as a computor. He left that organization to become associated with Creole as a subsurface geologist and as an engineer on underwater gravimeter sur-

veys in the Lake Maracaibo area of Venezuela. His experience also included work as a geologist-surveyor for a Creole exploration party.

After serving in the U. S. Navy from 1942 to 1944, Ingalls returned to Venezuela as a subsurface geologist for Creole. After a year he returned to the United States and joined the exploration division of Carter Oil in February 1947.

He was assigned at that time to the economics department to carry on special studies, and was engaged in that work when he joined The Journal. He will maintain his headquarters in The Journal's Tulsa offices.

TECHNOLOGY

Packaged Cracker

Small T.C.C. unit, prefabricated and hung in a derrick, will reduce installation costs for smaller refineries

George Weber

NEW YORK. — A new "packaged" catalytic cracking unit designed to be built within the framework of a standard oil derrick is now available to small and moderate-sized refineries where cracking facilities of moderate installation cost are required to keep pace with the current octane race.

Embodying the Thermofor catalytic cracking process, the unit has been designed by engineers of Socony-Vacuum Oil Co., Inc., developer of the original T.C.C. process. It has the same superimposed gas-lift process employed in nine 15,000-bbl. units now under construction in this country *(The Oil and Gas Journal, May 11, 1950, page 53)*.

The new packaged units are designed for nominal feed capacities of 3,000 and 6,000 bbl. per day. By means of standardization and prefabrication of vessels and units, the cost per barrel of feed capacity will be in line with the larger units, according to Socony-Vacuum.

Prefabricated.—The small-sized units can be constructed in the customary manner, say Socony-Vacuum engineers, but a primary objective has been achieved by designing the units so that they can be prefabricated entirely in shops and shipped by rail to the refinery site for erection. Prefabrication reduces both installation time and plant cost.

The catalytic section of the new units will be erected entirely within a standard 195-ft. oil-field derrick. The reactor, regenerator, catalyst-storage vessel, lift pot, and catalyst separator will be incorporated in the derrick structure. The only major revisions to conventional derrick design will be the strengthening of one leg on the corner where reactor and regenerator are installed, the installation of necessary platforms at reactor, regenerator, and separator levels, and installation of a stairway.

The derrick will serve as a construction rig while the plant is being erected, as vessels are so designed that they can be lifted into place within the derrick. Height of the entire unit will be 204 ft. to the top of the catalyst-air separator.

Based on the Socony-Vacuum design, Southwestern Engineering Co. of Los Angeles has worked out the complete details for prefabricating both sizes of the package T.C.C. unit. All vessels, complete with internals, will be shop-built. Their design was so worked out that no vessel or integral member of the unit will exceed the 12-ft. clearance required by railroads.

Low cost. — Southwestern estimates that prefabrication and standardization on the two capacity designs will bring catalytic cracking investment costs to a new all-time low. The units will be available in three sections, a feed preparation section, the catalytic cracking section, and the fractionation and stabilization section. These will be available singly or in complete cracking plant form.

While actual installed cost is subject to varying labor and material influences, Socony-Vacuum estimates that the 3,000-bbl. cracking section can be completely installed for about $100 to $125 per barrel per day capacity, not including feed preparation or gas-plant facilities. The entire package comprising a 3,000-bbl. per day self-contained catalytic cracking unit can be installed for an estimated $1,000,000.

The 6,000-bbl. per day catalytic section, installed in the derrick, will be practically identical to the smaller size with the exception that two regenerators or kilns will be installed. Thus the larger unit should show a lower cost per barrel of charge capacity than the 3,000-bbl. unit.

The new units will be licensed under Socony-Vacuum patents. Royalties may be handled on two bases. A paid-up rate of $50 per barrel of fresh feed handled per day is determined by the average runs of fresh feed to the unit on a calendar-year basis. As an alternate, a running royalty of a straight 3 cents per barrel of fresh feed may be paid the licensor.

Given feed-stock stipulations and samples, Socony-Vacuum will make pilot-plant runs at the Paulsboro laboratories and will give performance guarantees. The units are designed to meet the requirements of practically all feed stocks, and as a result, no changes are anticipated in the standardized design.

Whole crude, topped crude, reduced crude and varying cuts of gas oil may be charged. In units built by Southwestern, vessels will be fabricated of suitable alloys to allow operation on sour crude stocks. The entire unit is designed to occupy a plot area 150 ft. by 200 ft. Complete prefabricated plants of this type may be installed within an estimated 180 to 240 days after letting of the contract.

NEXT WEEK

New 1,250-bbl. "Kitten Cracker."—R. W. Jacobs, plant superintendent, Panhandle Producing & Refining Co., describes design and performance of new fluid catalytic cracker, smallest of the type operating in the United States. And he tells how the new premium motor-fuel producer fits into the over-all scheme of Panhandle's refinery operations.

Centrifugal compressors.—Engineering and operating data for these units, on the big natural-gas pipe-line system of Texas Eastern Transmission Corp., detailed by E. A. Koenig of Texas Eastern.

New 18-in. oil pipe line.—Construction and equipment employed in Humble's new West Texas-to-Gulf Coast crude-oil pipe line; article by district editor L. S. McCaslin, Jr.

Water flooding in eastern Kansas.—Development and operational data for the big Lynde, Walter & Darby systematic project in Humbolt-Chanute field. This is the oldest and largest water flood in that territory. First of a series of four articles on water-flood development in eastern Kansas.

Open-hole shooting.—Article describes new jet process for obtaining better well completions.

Heysham refinery.—Description of rearrangement and expansion of large Shell plant at Cheshire, England.

World Production

Gains nearly everywhere lift April crude output to new high record; most foreign areas far ahead of last year

Dahl M. Duff

GAINS in output both in the United States and many foreign areas lifted total world production of crude oil to another new record high in April.

The foreign total, exclusive of Russia and Eastern Europe, was approximately 3,908,000 bbl. daily, a 2.5 per cent gain over the preceding month. Venezuela, Saudi Arabia, and various smaller producing countries contributed to the increase.

Estimated United States production in April of 5,006,000 bbl. daily also represented a gain of about 2.5 per cent over March. These two figures, together with the estimated Communist-controlled production, gave an indicated world total of nearly 9,770,000 bbl. daily, about 221,000 bbl. daily above the previous month.

The foreign production total, exclusive of Russia and Eastern Europe, was 95,200 bbl. daily over the total of March. Continued production increases in Venezuela and Saudi Arabia through the month of May indicate that this figure may reach 4,000,000 bbl. daily.

United States production is still slightly below the level of a year ago. Virtually all foreign areas, on the other hand, in April were producing at from 10 to 20 per cent higher than they were in April 1949.

The total of foreign, less Russia and Eastern Europe, in April was more than 14 per cent above the same month of last year. Considering the United States, however, which is about at last year's level, total world production shows an increase of only 6.2 per cent, over April 1949.

Latin America.—Venezuelan production in April, officially reported at 1,441,400 bbl. daily, was 54,800 bbl. daily, or about 4 per cent, over March. It was the highest since January's all-time record Venezuelan production of 1,464,900 bbl. daily.

Improved demand for heavy fuel oil in the United States, increased shipments to Europe, and the recent agreements of the American refiners with the Argentine Government regarding dollar-oil imports, all helped lift the level of Venezuela's April production. The voluntary cutback program instituted by the Venezuelan operators in February at the request of the Government has been abandoned.

Venezuelan production this April was 241,200 bbl. daily higher than

WORLD CRUDE-OIL PRODUCTION
(Thousands of barrels daily)

Country—	April 1950	March 1950	April 1949
Western Hemisphere:			
Argentina	61.0	61.0	57.1
Bolivia	1.7	1.6	2.0
Brazil	0.9	1.2	0.2
Canada	65.9	76.0	60.4
Chile	1.5	1.5	...
Colombia	94.0	87.0	85.6
Cuba	0.4	0.3	0.2
Ecuador	7.3	7.2	7.3
Mexico	188.8	180.0	159.6
Peru	41.0	41.0	40.0
Trinidad	56.0	57.0	56.8
Venezuela	1,441.4	1,386.6	1,200.2
Total	1,959.9	1,900.4	1,669.4
Europe and Africa:			
France	1.4	1.4	1.1
French Morocco	0.8	0.8	0.3
Germany	21.2	20.6	15.3
Italy	0.2	0.2	0.2
Netherlands	13.7	15.4	11.7
Egypt	43.6	42.5	48.1
United Kingdom	1.2	1.0	0.9
Total	82.1	81.9	77.6
Middle East:			
Bahrein	30.0	29.8	29.9
Iran	685.4	706.5	589.3
Iraq	122.2	113.1	61.5
Kuwait	305.5	311.6	280.9
Qatar	30.0	34.3	...
Turkey	0.6	0.6	0.3
Saudi Arabia	465.6	411.5	523.6
Total	1,639.3	1,607.4	1,485.5
Other Asia:			
British Borneo	80.0	80.0	65.0
Burma	0.5	0.5	0.5
China	1.3	1.3	1.5
India	5.5	5.5	5.3
Indonesia	128.0	125.0	108.3
Japan	5.4	5.3	3.6
New Guinea	4.6	4.6	4.7
Pakistan	1.5	1.0	1.5
Total	226.8	223.2	190.4
Total, foreign less Russia and E. Europe	3,908.1	3,812.9	3,422.9
Estimated Communist-controlled areas:			
Austria	22.0	22.0	18.0
Romania	80.0	82.0	92.0
Russia	730.0	730.0	635.0
Other E. Europe	23.0	23.0	17.0
Total	855.0	857.0	762.0
Total foreign	4,763.1	4,669.9	4,184.9
United States	5,006.0	4,877.8	5,011.8
Total world	9,769.1	9,547.7	9,196.7

Figures are authoritative for the more important producing countries of the Middle East, Europe, and the Western Hemisphere. In other cases, estimates have been made based on the performance of previous months. Figures heretofore shown for the periods covered in the second two columns have been revised where indicated. Data for Russia and Eastern Europe reflect what is believed to be the approximately level of current production.

a year ago. This represents a percentage increase of 20 per cent.

Production increases were also reported in several other Latin American countries. Among them was Colombia where the new stations on the Andian pipe line permitted a sharp rise in output, especially from Shell's Casabe area. Colombian production was 7,000 bbl. daily, or about 8 per cent, over March, and it is expected to reach 100,000 bbl. daily in the near future.

PRODUCTION OF MAJOR VENEZUELAN FIELDS

(10,000 bbl. daily or more)

Field—	April	March
Western Venezuela:		
Cabimas	85,085	78,797
Lagunillas	384,679	381,853
Tia Juana	153,412	156,291
La Paz	148,885	143,607
Bachaquero	108,848	82,892
Mene Grande	48,555	46,976
El Cubo	11,585	11,578
Mara	72,797	78,371
Eastern Venezuela:		
Quiriquire	53,721	55,016
Oficina	37,333	27,386
Jusepin	18,164	25,263
Mulata	19,100	19,659
Nipa	37,502	24,943
Las Mercedes	18,628	17,673
Taman	10,752	10,457
Santa Barbara	20,354	21,777
Guico	11,099	9,469
Guara	51,357	53,378
Chimiri	32,078	28,497

Mexico's production also continues to rise. Preliminary figures show about 189,000 bbl. daily in April. This is some 5 per cent higher than the March output and about 18 per cent above April 1949. A recent statement of Antonio J. Bermudez, director general of Petroleos Mexicanos, said the agency had increased first-quarter 1950 production 26 per cent over the corresponding quarter of 1949. Bermudez also said Pemex drilled 33 per cent more wells in the first quarter with a total footage 60 per cent greater.

Production which was began early this year on a commercial basis in Chile's Tierra del Fuego field, continues at about 1,500 bbl. daily. It is not expected to rise appreciably until after construction of a gasoline plant to recover light fractions. Total production is forecast at 750,000 bbl. daily this year, and 1,000,000 bbl. in 1951.

Europe.—In Western Europe, Germany reached another postwar high with 21,200 bbl. daily. Germany production is now nearly 40 per cent above a year ago. In the Netherlands, output dropped back from the record level of March.

Middle East.—Despite slight declines in Kuwait and Iran, production in the Middle East reached another new high in April as a result of an increase in Saudi Arabia. Arabian American Oil Co.'s April output of 465,600 bbl. daily was 13.2 per cent above the previous month. However, Aramco production in April still reflects earlier declines and is about 11 per cent under a year ago, due to currency difficulties in marketing this American-produced dollar oil.

Kuwait, at about 305,500 bbl. daily, was down some 6,000 bbl. daily under the record level in March. Iranian production by Anglo-Iranian Oil Co., Ltd., also dropped back about 21,000 bbl. daily under the record 706,500 bbl. daily in March. Both these areas, however, are still well above a year ago.

In the Middle East as a whole, April production of nearly 1,640,000 bbl. daily represented an increase of 2 per cent over the preceding month and more than 10 per cent over the level of April 1949.

Japan.—Japan's small indigenous production is showing a continued upward trend which is particularly encouraging to the Japanese producers. Many operations have been shut down during the winter months, and the production rate is expected to increase to possibly 6,000 bbl. daily later this summer.

TREND OVER THE LAST YEAR

	W. Hemisphere less U. S.	Middle East	Total foreign less Russia & E. Europe
May	1,768.5	1,417.6	3,472.8
June	1,768.8	1,375.7	3,433.3
July	1,800.2	1,338.7	3,428.1
August	1,859.9	1,323.9	3,473.1
September	1,931.8	1,351.5	3,574.9
October	1,921.6	1,428.6	3,645.9
November	1,925.9	1,472.7	3,683.0
December	1,929.3	1,489.8	3,711.9
January	1,946.5	1,491.4	3,733.4
February	1,820.6	1,566.6	3,689.4
March	1,900.4	1,607.4	3,812.9
April	1,959.9	1,639.3	3,908.1

Sterling Oil

Britain's latest note avoids formal agreement on problem but hopes of settlement seen in individual arrangements

WASHINGTON.—State Department officials this week were considering what reply should be made to the memorandum on the dollar-sterling oil controversy recently submitted by Victor S. Butler, undersecretary of the Ministry of Fuel and Power.

Butler has returned to London, staying in Washington only long enough for brief talks with officials on the points raised in the memorandum, which reportedly skirted around but did not specifically discuss the basic points repeatedly raised by the department in its notes and negotiations.

The British note was a partial answer to some questions and offered some slight liberalization of the incentive scheme originally offered when the order supplanting dollar oil by sterling oil was protested, but there was no suggestion that the American companies would be permitted to sell for sterling and convert the dollar component as requested by the State Department.

Much of the note was devoted to discussion of the various agreements which the Ministry of Fuel and Power has entered into with the individual companies. California - Texas officials are now negotiating with the ministry in London and Arabian-American Oil Co. is believed also engaged or preparing to engage in discussions.

Officials here believe the companies may have gone further in their individual negotiations than the State Department would have, but point out that the major objective is to regain the lost business for the companies.

Meanwhile, there are indications that the whole question of British-American oil relations may iron itself out through these individual agreements. It is pointed out that the British have had difficulty in finding the "surplus" oil which they said the substitution order was designed to market, and officials in London who had dwelt upon the dollar content of oil now find themselves attempting to explain how it is that there are any bars against American companies which are selling oil for 100 per cent sterling—and thus without any dollar cost to the British—while sterling oil with a considerable dollar component is being forced on the market.

An informal solution of the problem also would be welcomed by the British Labor Government, it is believed, as saving them the necessity of entering into any formal agreement with the State Department.

Department officials are represented as determined not to retreat from their position, but privately express satisfaction that the companies are being permitted to return to the nonsterling markets through such steps as the I.P.C. arrangement and the agreements entered into with Argentina by two American companies. If Caltex and Aramco can secure similar agreements, it is said, the companies will be back full strength in the nonsterling markets and will be in good position in the sterling area.

The department will press its demands for abandonment of the substitution order despite these developments, since there is no assurance that a situation might not arise in the future which would lead the British to renew its bans on American company operations.

Free Trade in Arabia

Aramco drops paternalism; requires employes to pay for services; encourages private business, local currency

ARABIAN AMERICAN OIL CO.'S new employe-relations program in Saudi Arabia represents a move in the direction of greater individual freedom of choice with less of the "company town" aspect to its operations.

On May 1, Aramco substituted a living-cost allowance in money for most of the benefits previously provided free of charge. For its some 2,200 American employes in Saudi Arabia, this meant that food, housing, recreation, and other items provided by the company are now paid for out of the new allowance.

The change abolished what had been called the "gimme" system. Careful computations were made to arrive at a living-cost allowance which fairly met the needs of the average individual.

Aside from fixed charges for rent and utilities, he can apportion the allowances as he wishes. Under the program a person not using all the allowance keeps the difference. On the other hand, one exceeding it makes up the balance.

No complaints.—Aramco officials said there have been virtually no complaints as a result of the new plan. At the time of its inauguration, however, and in connection with figuring the allowance for the various classifications, some unsuspected and long-standing personnel problems were uncovered and dealt with.

A few company services have necessarily been kept on the benefit list. Transportation is still provided around the company areas, and a launch is operated to and from Bahrein. Medical attention continues free to all. Much of this latter service is due to conditions of climate and is thus not wholly an item of expenses that would be counted in the normal personal budget in the United States.

Other facilities and supplies previously furnished free and without an accounting by the company to its employes are now set up on a charge basis, to be met out of the compensating new living-cost allowance. Though these charges are largely at cost, the entire system serves to place the Aramco communities on much the same economic basis as similar-size towns in the United States.

The new plan was one of the recommendations made by a company personnel advisory group which studied first-hand the methods used in this connection in several other Middle East countries and in Venezuela.

Advantages.—Several advantages are anticipated by the company. One will be a tightened up and more efficient operation. Another is that it will tend to promote the establishment by Saudi Arabs of small independent stores and businesses providing various services. This has long been a goal of the company. In addition, it is felt that a living allowance rather than free benefits will make the employe more conscious of the amount of his total compensation.

Inaugurated at the same time by Aramco was the use of Saudi Arabian currency, the unit of which is the riyal. Heretofore, the average employe had little use for money of any kind since practically all his needs were met from free company benefits. Now the riyal is the regular medium of exchange in Dhahran, Abqaiq, and Ras Tanura.

Because of the difficulties being experienced by its parent companies in marketing oil throughout the dollar-short Eastern Hemisphere, Aramco is gradually shifting its operations over to a partial soft-currency basis. The new program providing a money allowance for living expenses may have advantages in this respect, although it was not directly the result of the shift to nondollar expenditures.

Aramco has had under discussion with the Saudi Arabian Government the matter of supplying some soft currencies instead of dollars or gold sovereigns against the royalty account. Unofficial reports have mentioned 25 to 40 per cent soft-currency payments for royalty, and presumably riyals also would be acquired for other than dollars.

Soft money.—The company's soft-currency plans, coupled with rumors about the general international oil situation, initially caused concern among some American employes as to their future with the company. However, the company's position was frankly set out in March in a general letter from the Aramco president, W. F. Moore.

Few if any dismissals are being made or are planned by the company to allow for replacement by nationals of other countries who can be paid in nondollar currencies. These substitutions are being accomplished largely in the normal turnover of employes, and in addition, contract renewals are being screened more closely.

Many items of food from Eastern Hemisphere countries already are reaching the Aramco commissaries in Saudi Arabia. Officials said no difficulty was being experienced in replacing American foods with items of equal quality from such countries as Sweden or Australia. Thus far, the only food commodity not found elsewhere is powdered milk, which appears to be obtainable in satisfactory form only in the United States.

Haifa Refinery

Israeli officials seek way to reopen plant

DISCUSSIONS as to the future of the shutdown 83,000-bbl.-daily Haifa refinery have been opened in London between representatives of the Israeli Government and oil-company officials.

David Horowitz, economic adviser to the Israeli Government, and an Israeli oil official were in the British capital for the talks. The Haifa plant is jointly owned by Anglo-Iranian Oil Co., Ltd., and Royal Dutch-Shell through Consolidated Refineries, Ltd.

The refinery was closed down 2 years ago as a result of the Palestine-Arab war. The Iraqi Government refused to allow movement of crude through the pipe line from Kirkuk field, and the Egyptian Government has blocked shipments destined for the refinery from going through the Suez Canal.

Some months ago partial operation was restored using crude brought in from Venezuela, but this program was abandoned as uneconomic.

The Israeli Government has been pressing for some solution to the deadlock. Israel estimates the plant shutdown is causing the loss of $18,000,000 a year in foreign currency since products have to be imported. The refinery was a major source of supply for Europe, and Britain's loss in foreign exchange from the shutdown is placed at more than $50,000,000 a year.

A recent report from Haifa said that corrosion may prove to be a graver problem than the political deadlock. Another winter of idleness would reduce the efficiency of the equipment to such an extent that renovation and replacement might become prohibitive. A maintenance crew is doing everything possible to protect the plant, but caring for some of the equipment against rust and weather is very difficult.

One distillation unit could probably be made ready for operation within a few weeks, it was reported, but at least 6 months would be needed before the two other and larger units could be prepared to operate. The two reforming units, which have scarcely been used since their installation, would probably take even longer. The refinery power house is now supplying electricity to Palestine Electric Corp. There has been some talk in Haifa of restarting the sulfuric acid plant.

PERSONALS

Drilling Executive

Whitley has had varied oil-field experience

FRANK J. WHITLEY, coowner and vice president of the recently organized B. B. M. Drilling Co., Houston, has had a varied experience in the oil industry.

A graduate of Georgia School of Technology in 1933 with a mechanical-engineering degree, Whitley joined J. S. Abercrombie Co. immediately following, and for 2 years worked as a roustabout, switcher, gager, warehouseman, and assistant production superintendent.

In 1936 he was transferred to Abercrombie's Houston office as engineering assistant to the general superintendent. He returned to the field in 1937, and until 1940 was drilling engineer in charge of muds, equipment, directional drilling, and well completions.

After serving with the Navy as an officer from 1941 to 1945, he returned to Abercrombie as manager of the drilling and transportation departments. He was made assistant to the vice president and manager in charge of operations in 1948.

Whitley served in this capacity until January this year, when he resigned to help form the B. B. M. Drilling Co.

Morris L. Etheredge, petroleum engineer for Stanolind Oil & Gas Co. at Port Arthur, Tex., has been moved to Lake Charles, La., in that capacity.

M. M. Brisco has been made division superintendent at the De Mares concession of Tropical Oil Co. in Colombia. He succeeds **R. V. Welch** who has been transferred to Imperial Oil, Ltd., at Redwater, Alta., Canada.

Charles K. Gamble, vice president and director of Standard-Vacuum Oil Co., is retiring from the company. Gamble, who has spent nearly 35 years in the petroleum industry, served 18 years as a marketing executive in Australia, New Zealand, and the South Pacific before coming to New York in 1945.

Sam L. Riley, engineer for Interstate Oil Pipe Line Co. at Cromwell, Okla., has retired from the company after more than 30 years of service.

J. R. Lynch, petroleum engineer at Rangely, Colo., for the California Co., has been transferred to the Wilson Creek field as field engineer.

H. L. Hoover, seismic party chief at Edmonton, Alta., Canada, for The Texas Co., has been moved to the Brownfield, Tex., area in that capacity.

John R. Brack, formerly at Iraan, Tex., for Ohio Oil Co., has been transferred to Midland, Tex., as reservoir engineer, and **Forrest W. Hood,** formerly geologist at Tyler, has been moved to Shreveport as district geologist.

James R. Anderson will be meteorologist in charge of the American Institute of Aerological Research's newly established Houston office, in association with **Col. T. R. Gillenwaters.** The institute has done considerable work in the field of offshore drilling.

E. H. Leemann, exploitation engineer, Shell Oil Co., has been transferred from Houston to Franklin, La., as division exploitation engineer. Other changes include: **J. B. Green,** seismograph operator, transferred from Houston to Party 17 in the same capacity; **A. B. H. Growden,** rotary driller, Delta district, named barge foreman; **C. B. Iles,** clerk, Delta district, transferred to Donaldsville, La.; **R. W. Schutt,** mechanical engineer, transferred from Houston to Franklin, La., in the same capacity; **D. L. Metzger,** senior clerk, transferred from Baton Rouge to Harvey, La., in the same capacity; **M. G. Bingham, Jr.,** mechanical engineer, transferred from Houston to Corpus Christi in the same capacity; **A. K. Dittmer, Jr.,** mechanical engineer, named gas mechanical engineer at Houston; and **W. R. Wyatt, Jr.,** mechanical engineer, Houston regional production, transferred to Houston area as gas engineer.

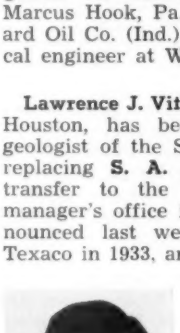
George C. Bradley, formerly western regional manager for Imperial Oil, Ltd., has been appointed assistant general manager. Other changes include: **H. L. Magee,** named to the new post of general sales manager; and **C. E. Tilston,** named eastern regional manager succeeding Magee.

C. A. Reid, tool pusher for Penrod Drilling Co. at High Island, Tex., has been transferred to Anahuac, Tex., in that capacity, and **T. E. Fisher,** tool pusher at Magnolia, Ark., has been moved to Shreveport.

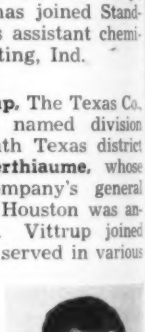
J. B. Moorhead, formerly district geologist, North Texas-Panhandle area, Continental Oil Co., has opened consulting offices in Wichita Falls, Tex.

George R. Helffrich, chemical engineer for Houdry Process Corp., Marcus Hook, Pa., has joined Standard Oil Co. (Ind.) as assistant chemical engineer at Whiting, Ind.

Lawrence J. Vittrup, The Texas Co., Houston, has been named division geologist of the South Texas district replacing **S. A. Berthiaume,** whose transfer to the company's general manager's office in Houston was announced last week. Vittrup joined Texaco in 1933, and served in various



L. J. VITTRUP



S. A. BERTHIAUME

capacities in the petroleum-engineering department. He was named subsurface geologist in 1937, and in 1948 was named senior geologist of the South Texas division. Berthiaume, who now holds the post of senior geologist in the general manager's office, joined the company in 1940, and has been division geologist for the South Texas district since October 1948. **Harold D. Becwar,** Corpus Christi geologist, will replace Vittrup as senior division geologist; and **J. B. Vreeland** will serve as acting geologist at Corpus Christi succeeding Becwar.

Clifton L. McCown, Mid-Continent general exploration manager for Bay Petroleum Corp., Wichita, has resigned, and will become an independent operator. His office will remain in Wichita.

S. P. MANDELL

S. P. Mandell, formerly of Houston and Amarillo, Tex., has become associated with **Sol Smith,** consulting petroleum and natural-gas engineer at Austin. Mandell is a graduate of Texas A. & M. College, and was with Magnolia Petroleum Co.'s natural-gas division before joining Smith.

Dr. W. P. Jenny, consulting geologist and geophysicist, Houston, will leave for Europe the end of this month, and will return to this country the latter part of September.

George F. Gast, supervisor of the steam and power department at Tide Water Associated Oil Co.'s Bayonne, N. J., refinery, has retired from active service. He had been with the company since 1918.

B. Oliver Wood, formerly with Brundred Oil Corp. at Ottawa, Kans., has joined Luse & Ice at Monahans, Tex., as petroleum engineer, specializing in water-flood operations.

Ernest J. Sneed, formerly supervisor of drilling and producing operations in West-Central Texas for Lone Star Producing Co., with headquarters in Eastland, Tex., has been transferred as district production foreman to Snyder, Tex.

D. E. Fickinger, seismic party chief for Continental Oil Co. at Gainesville, Tex., is now located at Bismarck, N. D.

R. E. Kellerman, field engineer at Pauls Valley, Okla., for Republic Natural Gas Co., has been transferred to Midland, Tex., as petroleum engineer.

James M. Catterton, Albany, Calif., has joined Tide Water Associated Oil Co. as research engineer at Ventura, Calif., specializing in drilling-fluids research.

T. H. Sandoz, district superintendent in West Texas for Pan American Production Co., has been transferred from Abilene to Snyder in the same capacity.

George Legh-Jones, a managing director of Shell Transport & Trading Co., Ltd., and one of the top officials of the Royal Dutch-Shell organization, has been knighted. The title was conferred in the Birthday Honors List published recently in London on the occasion of the official birthday of the King of England.

M. E. Jones, formerly a member of the legal department of Standard Oil Co. (N. J.), and **E. M. Robinson,** head of the material department of Creole Petroleum Corp., have been appointed members of Creole's management committee in Venezuela. Jones, a 1936 graduate of the University of Oklahoma, was with Carter Oil Co. prior to 1938 when he joined Creole in Venezuela. He went with Standard Oil Co. of Brazil in 1946 and later with the parent Jersey Standard company in New York. Robinson has had 25 years of experience in the oil business since

M. E. JONES

E. M. ROBINSON

he first worked for Oklahoma Producing & Refining Corp. in 1924. He went first to Venezuela in 1934, returning in 1942 after 4 years in Romania as comptroller of Jersey Standard's Romanian affiliate. He was made head of the Creole's material department last year.

Walter J. Pung, engineer for Humble Oil & Refining Co. at Crowley, La., has been transferred to Pampa, Tex., as district petroleum engineer.

Harry A. Trower, vice president of Phillips Petroleum Co., Bartlesville, Okla., has retired from active service after 32 years with the company. He joined the firm in 1918 as sales and traffic manager, and filled various sales positions. In 1930 he was elected vice president of sales, and in later years became a general vice president of Phillips, designated to work on special assignments. He is a former president of the Natural Gasoline Association of America and is serving as district chairman of the Oil Industry Information Committee.

Ivan E. L. Caldwell, sales department manager of Creole Petroleum Corp. in Venezuela, has joined Esso Standard Oil Co. (Puerto Rico). His position with Creole has been filled by **Fred C. Rawson,** formerly general manager of the Puerto Rico Esso company.

R. E. O'Donnell has joined Republic Natural Gas Co., Dallas, as drilling superintendent. He formerly was with

PETROLEUM MOTOR TRANSPORT OFFICERS.—Above are officials of the Petroleum Motor Transport Asscciation of Oklahoma, who will serve during the 1950-51 season. Left to right, seated: R. C. Hopper, first vice president, Skelly Oil Co.; H. E. Thompson, president, Stanolind Oil & Gas Co.; Ken H. Miller, secretary-treasurer, Service Pipe Line Co. Standing: C. E. Jackson, director, Mid-Continent Petroleum Corp.; H. J. Chambers, director, Oklahoma Natural Gas Co.; J. W. Rayborn, director, Tide Water Associated Oil Co.; W. H. Esser, director, Shell Oil Co.; Harvey L. Bryant, director, Pure Oil Co.

PERSONALS

SHELL EXECUTIVES.—Shell Oil Co.'s top exploration executives are shown on a visit to the company's exploration and research laboratory during the recent annual meeting in Houston. Left to right: Dr. H. M. E. Schurmann, The Hague; A. J. Galloway, vice president, New York; S. F. Bowlby, vice president, Los Angeles; E. D. Cumming, vice president, Houston; and Dr. Harold Gershinowitz, director of exploration and production research, Houston.

Halliburton Oil Well Cementing Co., Duncan, Okla., and prior to that was associated with a number of drilling contractors in the Mid-Continent area.

T. C. Hoke, Tulsa, vice president in charge of exploration for British-American Oil Producing Co., has resigned, effective immediately, and will enter private practice as a consulting geologist. He joined British-American in 1944 as district geologist at Oklahoma City, and was later named chief geologist.

Rycroft G. Moss, independent geologist, has established offices in Oklahoma City, specializing in reservoir geology and engineering.

E. W. Fosshage, formerly chief geologist for Shamrock Oil & Gas Co. and senior stratigrapher for Shell Oil Co., has opened a sample-log service in Amarillo, Tex.

A. L. Hall, Tulsa, has been elected assistant vice president of Commerce Trust Co., Kansas City, and has joined the firm as head of its oil and gas department. Hall formerly was with Phillips Petroleum Co. and for the last year was assistant to the vice president in charge of production for Deep Rock Oil Corp.

Robert H. S. Eakens, advisor to the State Department office of international trade policy, has been assigned to Newport, R. I., where he will take the senior course at the Naval War College. Eakens will leave Washington August 1 and will be gone for 1 year.

David Johnston, senior petroleum engineer for Humble Oil & Refining Co., has been transferred from the Southwest Texas division to the West Texas division. Other changes include: **L. E. Cezeaux,** tool pusher, moved from the Mallalieu district, Louisiana division, to the Odessa district, West Texas; **E. C. McCanlies,** district chief clerk, transferred from the Anahuac, La., gasoline plant to the Jourdanton gasoline plant; **M. L. Hambrick,** district chief clerk at Opelousas, La., gasoline plant, transferred to Anahuac replacing McCanlies; **Jesse William Weise,** senior civil engineer, moved from Jourdanton plant construction district to the North Texas division; and **Leroy W. Foerster,** district civil engineer, Houston area, transferred to North Texas division as civil engineer.

B. M. Beins, C. L. Raymond, M. Souders, Jr., and **D. L. Yabroff** have been appointed associate directors of development for Shell Development Co., Emeryville, Calif. Other changes include: **C. R. Nelson,** named department head of process engineering, with **A. J. Cherniavsky** and **G. E. Liedholm** as assistant department heads; **G. A. Nelson,** named staff metallurgist; **W. E. Hand,** named head of costing and appraisals; **P. D. Hishon,** appointed chief development draftsman; **P. R. Hoyt** and **M. V. Long,** named staff instrumentation consultants; and **D. J. Pompeo,** appointed head of a new department consolidating the instrument research and development groups. **T. W. Evans,** director of research, is head of the research division and **A. J. Johnson,** vice president and director of development, will be in charge of the development division. **H. E. Randlett, Jr.,** is administrative assistant to the director of research.

DEATHS

Charles B. Carpenter, 48, supervising engineer of the Dallas petroleum field office, U. S. Bureau of Mines, died June 10. He had been with the Mines Bureau for more than 20 years. A native of Guthrie, Okla., he did engineering work for the old Marland Oil Co. in the Mid-Continent and Rocky Mountain areas before joining the bureau in 1928. He served as treasurer of the Petroleum Branch, American Institute of Mining and Metallurgical Engineers, from 1947-49, had been nominated for presidency of the branch in 1951.

David B. Catterlin, 68, retired auditor and assistant secretary of the Gypsy division, Gulf Oil Corp., Tulsa, died near Prairie Grove, Ark., June 13.

John G. Ellinghausen, 65, Tulsa independent oil-lease broker and attorney, was killed in an automobile accident near Siloam Springs, Ark., June 18.

Mrs. Annie McGrail Hughes, 71, chairman of the board of J. K. Hughes Oil Co., Mexia, Tex., died in Clifton Forge, Va., June 16.

Dr. Fred Riddell, 46, Detroit independent oil producer and discoverer of the Arbela Dundee oil field in Tuscola County, Michigan, died June 10.

George J. Anthony, 57, office manager for Socony-Vacuum Oil Co., Inc., at Port Socony, Staten Island, N. Y., died June 13 at Prince's Bay, Staten Island.

Oscar Gunkel, 96, oldest pensioner of Socony-Vacuum Oil Co., Inc., died June 12 in Harrington Park, N. J. He joined the old Standard Oil Co. of New York in 1892, served as auditor and marketing official in Mexico and other foreign posts, and was general manager of the company's Levant Division at the time of his retirement in 1923.

GULF COAST SECTION

THE OIL AND GAS JOURNAL

Capsule Facts and Figures...

EXPLORATION: A "happy hunting ground" for new oil and gas reserves, both on land and offshore . . . The area now contains in excess of 1,525 oil and gas fields (see large insert map in this issue).

DRILLING: Gulf Coast area accounts for over 21 per cent of total footage drilled . . . Well depth is 1.6 times national average.

PRODUCTION: Coastal production is 26 per cent of national total . . . Reserves are 19 times last year's production compared with 14 for U. S.

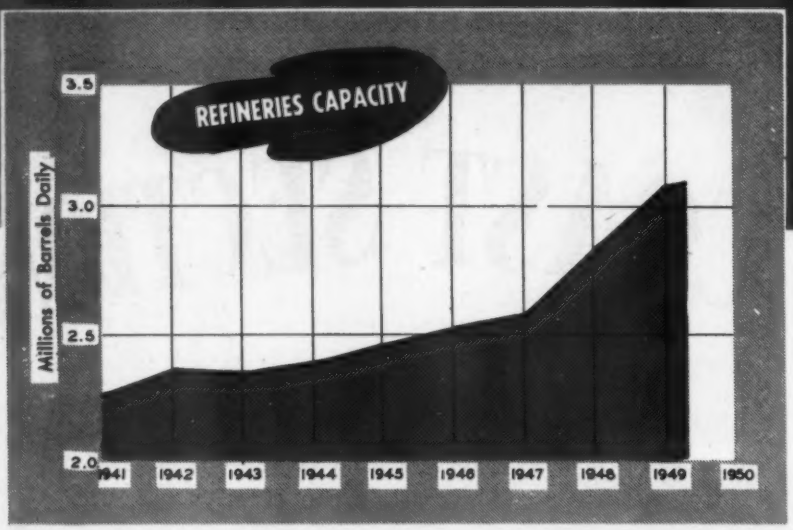
LIGHT HYDROCARBONS: The 49 Gulf Coast plants now have a capacity exceeding 7,000,000 gal. daily . . . Area has 68 per cent of total U. S. cycling-plant capacity (34 plants).

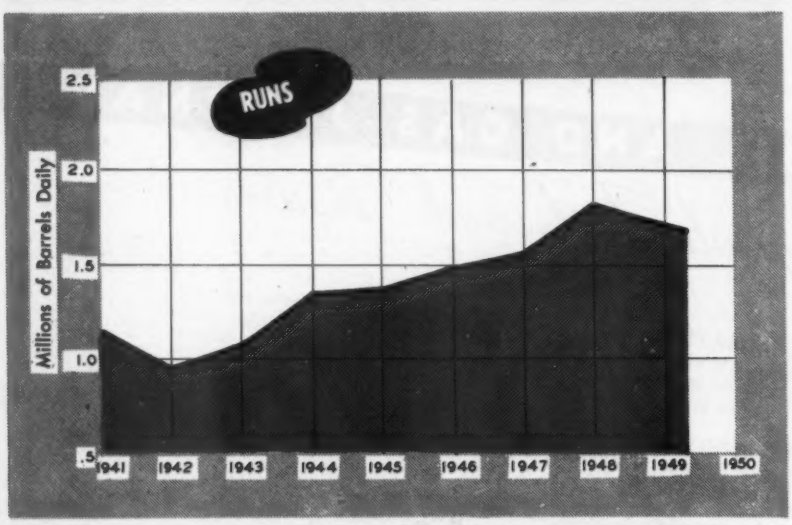
REFINING: Coastal area plants in Texas, Louisiana, Mississippi, and Alabama provide 31 per cent of the nation's crude-oil-refining input capacity . . . Thermal and catalytic cracking capacity in the coastal section of the four states is in excess of 1 million barrels daily.

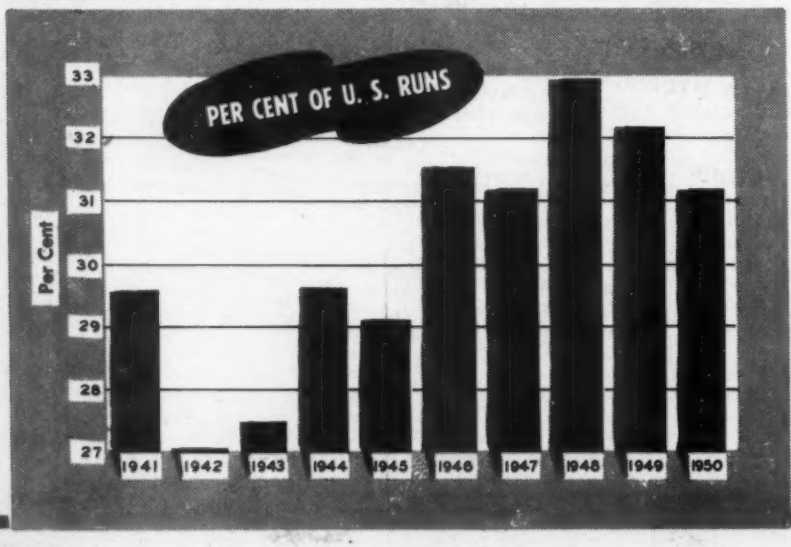
TANKER TERMINALS: The 98 tanker terminals in Texas, Louisiana, and Mississippi now have storage capacity of 186,500,000 bbl. These terminal operations reflect the heavy output of business the Gulf Coast conducts with the Eastern Seaboard and abroad.

JOURNAL SPECIAL REPORT:

Growth Pattern







ITS PLANTS ACCOUNT FOR 31 PER CENT OF U. S. REFINING CAPACITY

SOME of the largest refining operations in the United States are conducted in the Gulf Coast area. Taken altogether, the capacity ratings of these 41 different Gulf Coast plants represent 31 per cent of the total capacity rating for all of the 346 operating refineries in the nation.

Another way of looking at this "big plant" sizing of the Gulf Coast refining industry is this: Of all of the operating refineries in Texas, Louisiana, Mississippi, and Alabama, in point of view of numbers, only 50 per cent of the plants are located in the Gulf Coast areas of these states. Capacity-wise, however, the Gulf Coast portion of the refineries in these states exceeds 87 per cent.

Growth Pattern in Crude Runs

Crude-oil runs in Gulf Coast refineries so far this year and for the past 2 to 3 years have been at the general level of about 1,700,000 bbl. daily. This present operating level is a reflection of the steady growth pattern which has prevailed over the past decade.

And, as to how the Gulf Coast's crude-oil runs to refineries compares with the United States total, the figures for this year again exceed 31 per cent, as they did for 1949, 1948, 1947, and 1946. These data additionally emphasize the important position of the area in the nation's total facilities for manufacturing petroleum products.

Efficiency, Additional Improvements.

Operational efficiency of Gulf Coast refineries is maintained at a high level. The "onstream time" weighted averages for the 41 plants in the region also are well ahead of the national average.

....OF GULF COAST OIL INDUSTRY

Compiled by
Leigh B. McCastlin, Jr.
John C. Casper
R. B. Tuttle
of the Journal Staff

ITS CAT CRACKING PLANTS, 33 PER CENT; THERMAL CRACKING, 28

OVER-ALL picture of Gulf Coast refining facilities shows a remarkable arrangement of flexibility. This is emphasized in the changing yield pattern for the area. Over the last few years production of residual stocks has given way to middle distillates and gasolines, to balance with demands. Great quantities of all kinds of lubricating oil and greases also are manufactured, which with other items make an output aggregate of hundreds of specialized products. Petrochemical production also is a greatly expanding industry, but that story is told on other pages in this issue.

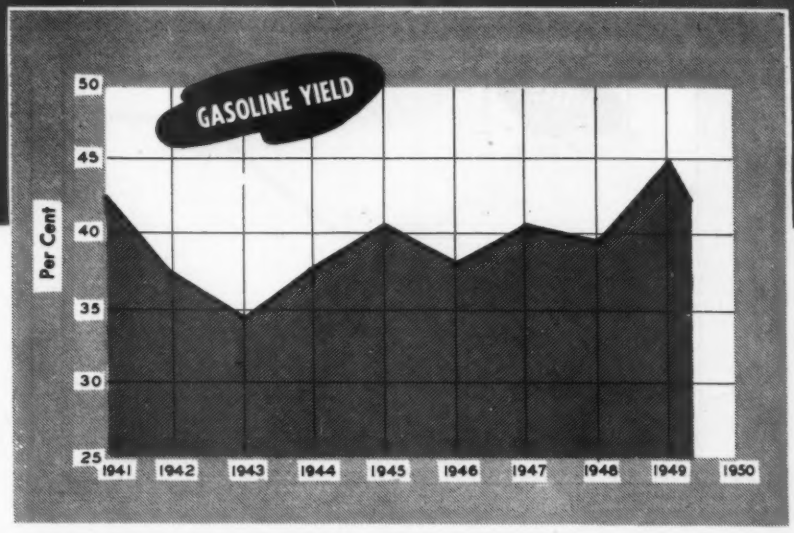
The Cracking Picture

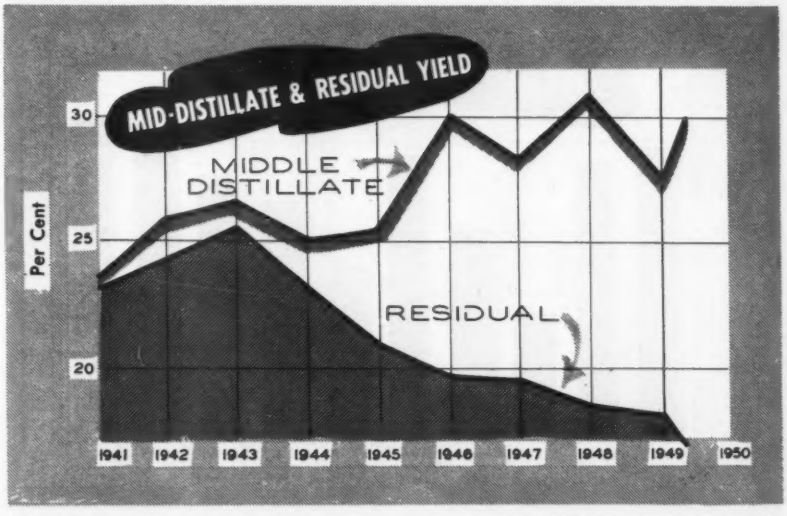
Catalytic and thermal cracking facilities totaling 1,022,100 bbl. per day are installed in 30 Gulf Coast refineries. Of this total, 25 refineries are equipped with 640,500 bbl. per day of thermal cracking capacity. The catalytic cracking capacity of 16 plants is 381,600 bbl. per day.

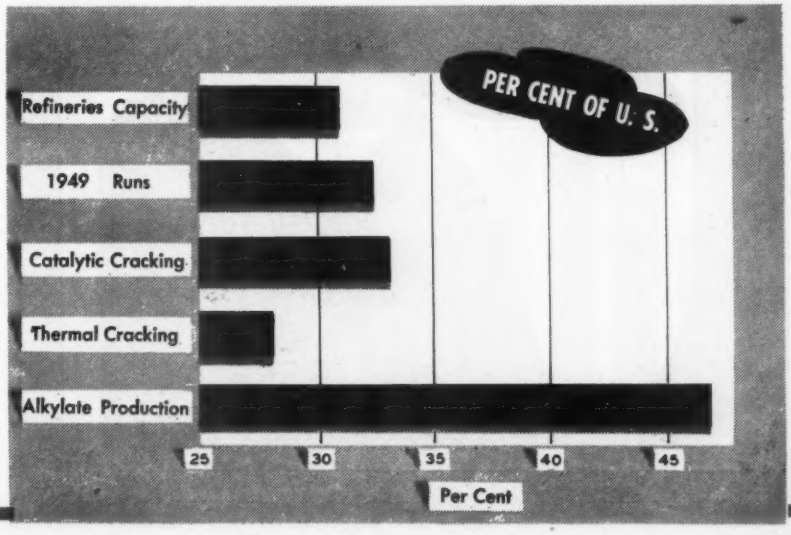
About two-thirds of the cracking capacity, both thermal and catalytic, of the Tex.-La.-Miss.-Ala. area is located in its coastal refineries.

Nine Texas Gulf Coast refineries currently include alkylation units in their processing layout, producing 76 per cent of the Gulf Coast alkylate. Coastal refineries in Louisiana produce the other 24 per cent of the area's alkylate, via four refineries.

Polymer gasoline facilities, 18,250 bbl. per day capacity, currently are operating in 28 per cent of the Gulf Coast plants in Texas. In Coastal Louisiana 36 per cent of the refineries are equipped with polymerization plants. On a capacity basis about 70 per cent of the polymer gasoline production in the area comes from Texas Coast refineries.







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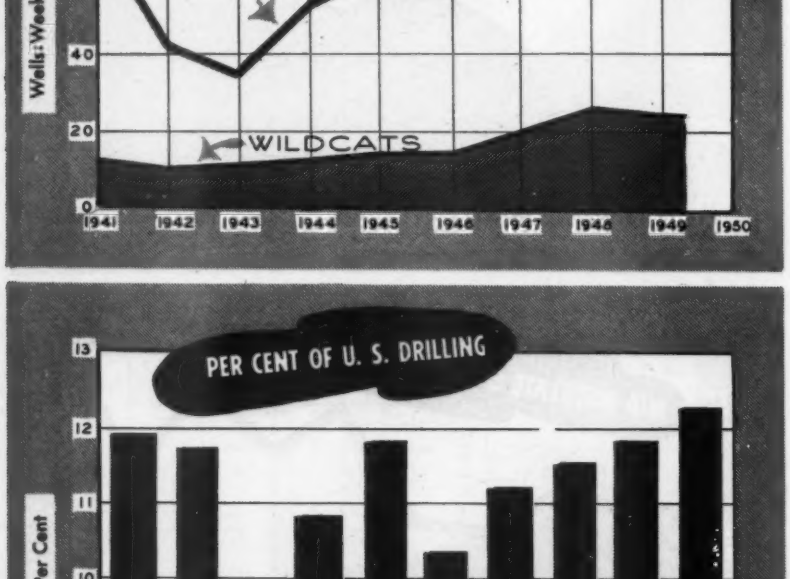
GROWTH PATTERN —DRILLING, WELL COMPLETIONS



GULF COAST FOOTAGE IS 21.2 PER CENT OF NATION'S TOTAL

WELL completions in the Gulf Coast area last year accounted for 21.2 per cent of total footage drilled in United States. Total hole drilled in the area amounted to more than 29,200,000 ft. or a little better than three and one-half times the diameter of the earth.

Total Gulf Coast completions for the year were slightly under 4,600 wells or 11.8 per cent of the total for all areas in the country. The difference in percentage figures for footage compared with completions was due to the deep drilling that is required in most sections of the Gulf Coast area.

The average well depth for Gulf Coast completions in 1949 was 6,360 ft. compared with a national average of 3,538 ft. On a basis of average depth, South Louisiana led the nation, as well as the Gulf Coast area, with the average well going to 8,802 ft. This accounts for the fact that South Louisiana was credited with 5.8 per cent of the national footage but only 2.4 per cent of total completions.

Average depth of completions in the Texas Gulf Coast area was 5,637 ft. or about 1.6 times the average for all completions last year. This coastal area of Texas accounted for about 64 per cent of total footage drilled in the Gulf Coast area last year and 13.5 per cent total United States footage.

Despite intensive drilling in other areas, particularly West Texas, Gulf Coast completions in the first 4 months of this year represent a slightly higher percentage of the national total than during the full year 1949. The coastal area's portion of the total for the January-April period is 12.2 per cent, greater than any total-year average since 1940.

Exploratory drilling in the Gulf Coast has shown a marked growth in the past 10 years. A total of 565 wildcat completions were reported for the area in 1941, but almost 2¼ times that number are expected this year. Expenditures for wildcat drilling will show an even larger gain since drilling has been extended to open waters of the gulf where total drilling costs are extremely high.

Based on the number of completions and average cost per well, Gulf Coast drilling probably takes a larger slice of the total national drilling budget than any other area in the country.

ITS WELLS PRODUCE MORE THAN FOURTH OF COUNTRY'S OIL

CRUDE production in the Gulf Coast area for 1949 was about 25.7 per cent of total production in the country, and even this was below normal since production cutbacks in Texas were more severe than in most other crude-producing areas.

The Gulf Coast portion of total production was 19.3 per cent in 1941 and remained relatively low in the early war years when tanker shipments were restricted because of submarine warfare. After the completion of the large crude and product lines to the East Coast, Gulf Coast production increased to better than 25 per cent of the country's total. The relative position of the area improved still further after the war, averaging better than 27 per cent for 1947 and 1948.

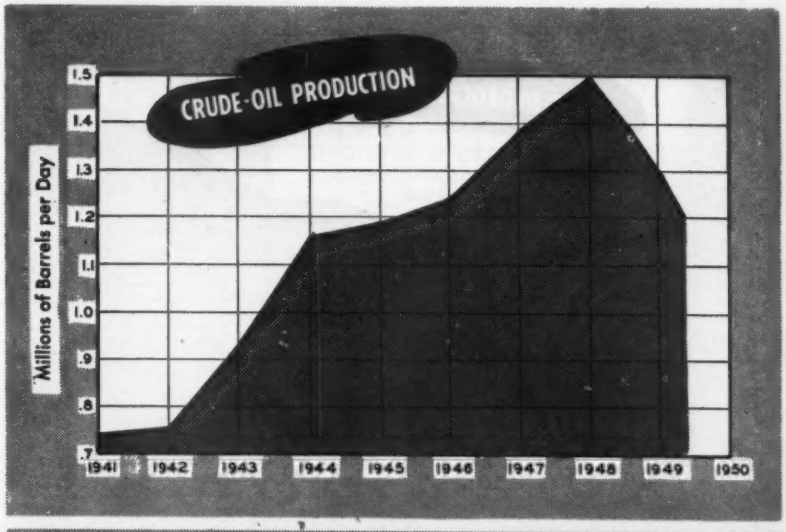
During the period of adjustment in 1949, sharp reductions were made in Texas production in order to balance supply and demand. Cutbacks in Texas output amounted to 89 per cent of the total reduction in crude production for the country as a whole. This accounts for the drop in relative position in Gulf Coast production last year.

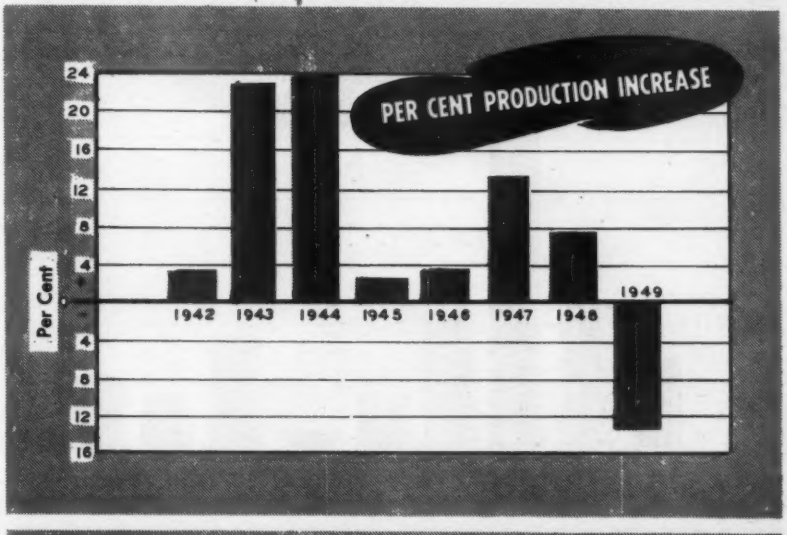
For March of this year, the Texas Railroad Commission returned to a proration formula based on depth and acreage which resulted in a Gulf Coast reduction amounting to more than 50 per cent of the total state cut for the month. However, the Gulf Coast districts received a large portion of the allowable increase in April and another increase for May came principally from the boost in allowables for the lube-base crude fields in the area.

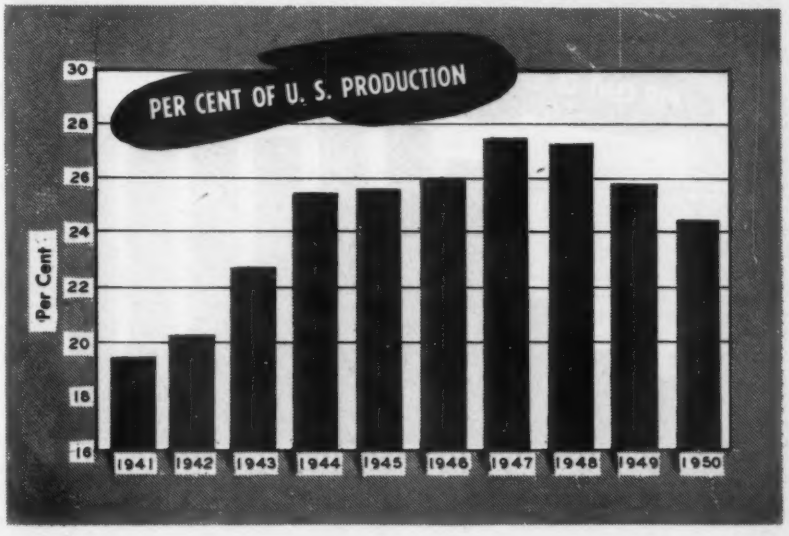
Increased product demands will bring increased production for the Gulf Coast area, particularly in Texas. The crude and condensate reserves in Texas Gulf Coast at the beginning of this year were 19 times production last year compared with slightly less than 14 for the country as a whole. This additional productive capacity will enable the Gulf Coast area to move back to better than 27 per cent of total United States production as higher product demands boost total crude output.

The shift toward increased production to meet these expanding demands is indicated by changes in allowables. For March of this year, the total allowable for the coastal districts of Texas was 634,804 bbl. daily. This month it is 777,647 bbl. daily.

GROWTH PATTERN —CRUDE-OIL PRODUCTION







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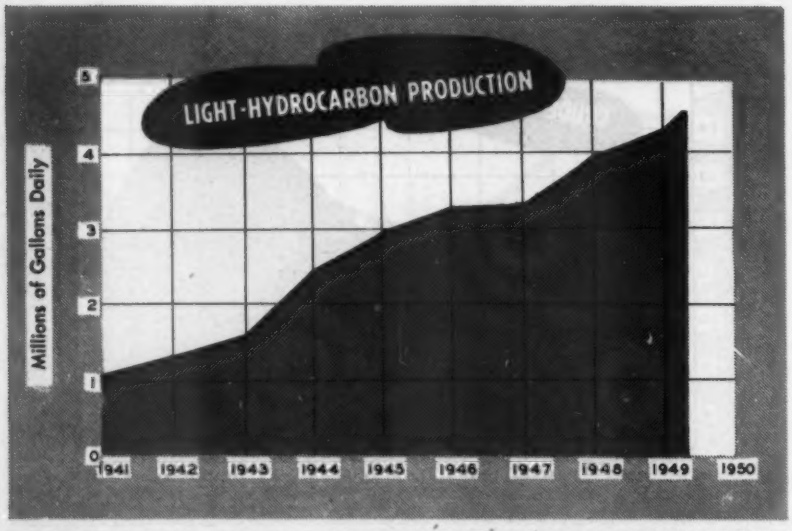
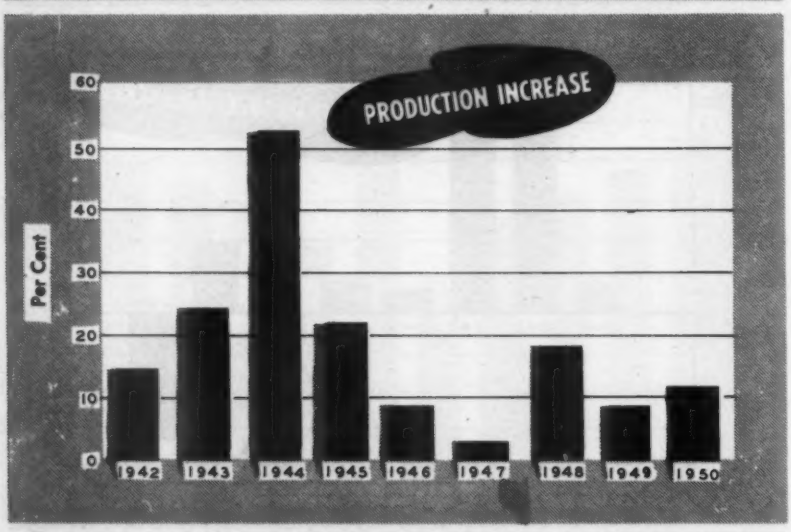
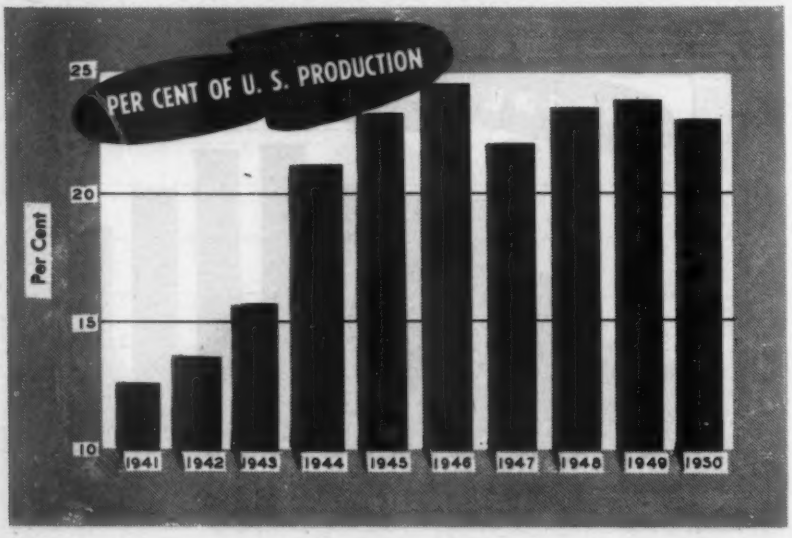
GROWTH PATTERN —NATURAL GASOLINE, CYCLING







GULF COAST PLANTS PRODUCE 7,000,000 GALLONS PER DAY

CYCLING-PLANT capacity in the Gulf Coast area represents about 68 per cent of total cycling capacity in the country, and the growth in cycling-plant construction has been a major factor in the phenomenal increases in Gulf Coast production of light hydrocarbons.

Total capacity at natural-gasoline and cycling plants in the Gulf Coast area is more than 7,000,000 gal. daily. Of this total, cycling plants account for about 70 per cent compared with a national ratio of cycling to total of about 24 per cent.

Since most cycling plants are large units, the high percentage of plants of this type on the Gulf Coast tends to give the area a greater average capacity per plant. The average for all natural-gasoline and cycling plants in the area is about 86,000 gal. daily compared with an average of 57,000 gal. daily for the country as a whole.

Not only has there been a steady growth of light hydrocarbon production in the Gulf Coast area but also a gain in relative position of the area compared with national totals. Production in 1941 averaged 1,133,000 gal. daily or about 12 per cent of the total output from all plants in the country. For the first 3 months of this year the daily average for the gulf area was 4,640,000 gal., or slightly more than 23 per cent of the national total. Gulf Coast production in the first quarter of this year represents an increase of more than 300 per cent over the average for 1941. In contrast, total light hydrocarbon production gained 117 per cent for the same periods and even this is an outstanding increase in the over-all petroleum picture. Crude production is up 28 per cent from the 1941 average.

Within the Gulf Coast area, the Texas districts have had a gain in output of better than 2,500,000 gal. daily since 1941 while the South Louisiana-Mississippi plants have increased 571 per cent. The gain in production for the Texas Gulf Coast districts since 1941 is equal to 25 per cent of the total increase for all plants in United States. Currently, plant output in the South Louisiana-Mississippi area is at about the same volume level as total Gulf Coast production in 1941.

With rubber and chemical plants currently taking better than 25 per cent of all L.P.G. sold in the country, the Gulf Coast area is the center for expansion of this phase of the industry.

ON PETROCHEMICAL PLANTS AND THE GULF COAST, DR. GUSTAV EGLOFF, UNIVERSAL OIL PRODUCTS CO., SAYS:

. . . "About 85 per cent of the petrochemical industry is concentrated along the Gulf Coast in Texas within a radius of 200 miles from Houston. The plants include those constructed and maintained by petroleum companies and chemical manufacturers. Prewar $65,000,000 would have covered the value of petrochemical plants in this area. During the war years both privately owned corporations and the Government invested about a billion dollars in chemical plants. Though there is considerable disagreement as to the exact value of these plants it is probable that the $1,000,000,000 is a conservative estimate. Since V-J Day, another $300,000,000 has been invested by private concerns and $250,000,000 more is earmarked for expansion projects."

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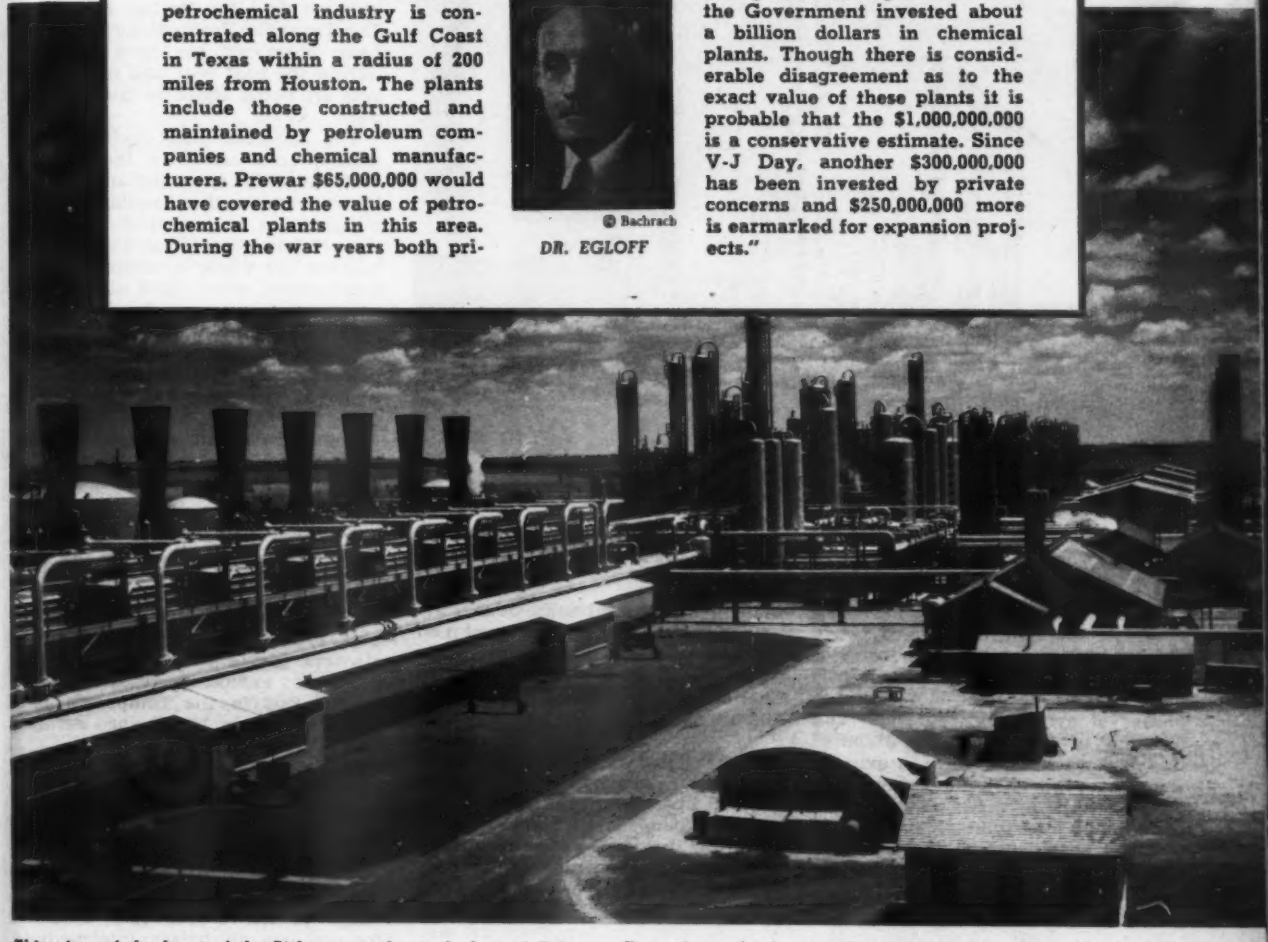
DR. EGLOFF



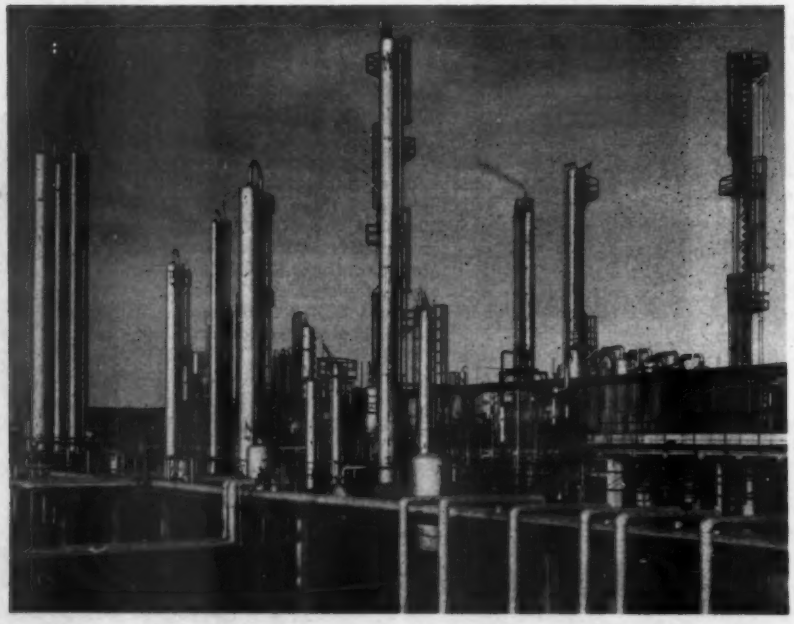
This view of the heart of the Bishop petrochemical plant of Celanese Corp. shows the fractionation section, center, where the four principal products—formaldehyde, acetic acid, acetone and methanol, are separated. To the left is a portion of the bank of 10 boilers of open-construction design. The oxidation sheds, where butane and propane are converted to many oxygenated chemicals, flank the fractionators on the right.

85 PER CENT OF NATION'S CAPACITY FOR Petrochemicals CONCENTRATED ALONG GULF COAST

by George Weber
Refining Editor

WITH crude chemical production equaling nearly 5 billion pounds last year, the burgeoning petrochemical industry is conservatively expected to more than double that record in 1950. Reflecting the output of new plants and substantial capacity increases in existing ones, the twofold increase in volume will be accompanied by an important widening in the range of chemicals produced.

Since an estimated 85 per cent of the industry's capacity is located within a 200-mile radius of Houston,[1] petrochemistry has become in large part identified with the Gulf Coast of Texas and Louisiana. Furthermore, recent developments in its headlong expansion tend to identify petrochemistry more and more with the petroleum industry.



Numerous byproducts of the direct oxidation of hydrocarbons are separated and processed in this section of the Celanese plant.

While chemical companies still dominate the field of finished petrochemicals, the petroleum industry is extending its role as supplier of basic hydrocarbons more and more into the phases of synthesis, separation, and finishing of such chemicals. Much of this new work takes place in existing refineries, for example, where isooctyl alcohol, glycerin, and benzene have come into tonnage production. Other projects, such as the Carthage Hydrocol - Stanolind - U. S. Industrial Chemical program at Brownsville are linked to the industry by a majority interest held by oil companies.

Two examples will be given of modern petrochemical operations in the Gulf Coast area. These are Jefferson Chemical Co. and the Celanese Corp. operations.

Jefferson at Port Neches

Jefferson Chemical Co. continues to expand operations at Port Neches, both as to range and volumes of petrochemicals produced from refinery gases. Organized in 1944 by The Texas Co. and American Cyanamid Co., the company first concentrated on volume production of ethylene glycol, ethylene oxide, and ethylene dichloride.

Refinery gases, principally ethylene, are supplied from the nearby 190,000-bbl. per day Port Arthur refinery of The Texas Co. Production of the three basic chemicals has been increased during the past year and other products are being added to quantity output.

The Jefferson plant includes three main process units. In the ethylene unit the refinery gases are purified by treatment with ethanolamine. This purified gas is combined then with the cracked gases from the cracking heaters, the whole is compressed and fractionated, much of it at low temperatures to recover the light components. Liquid propane and ethane are employed as refrigerants, being obtainable directly from the gases and liquefied during the compression stage.

The gas-compressor section compresses propane in the refrigeration system and the feed and heater effluent gases.

The unit produces three main streams of product: (1) a purified ethylene stream, (2) a distillate stream high in aromatics, and (3) a hydrocarbon polymer stream. The unit producing ethylene oxide and ethylene glycol was designed in the basis of extensive research work carried out in the company's pilot plant located in the Texaco refinery at Port Arthur.

Dichloride is purified by drying and redistillation in a separate unit, as the raw product contains considerable quantities of byproducts of higher chlorinated hydrocarbons.

Diethylene glycol went into volume production in March of this year. Alkyl phenol C-9, a new chemical for use as a plasticizer, intermediate and stabilizer, is now under development. Other petrochemicals are under investigation for future production, notably some ethanolamines, whose volume production is now under consideration.

This Girdler unit employs steam, air, and methane to produce hydrogen for the hydrogenation of some of the chemicals produced in the $30,000,000 Celanese plant at Bishop, Tex.

Celanese at Bishop, Tex.

Celanese Corp., which leads in production of petrochemicals by the direct oxidation of hydrocarbons, continues to expand operations at the $30,000,000 Chemcel plant at Bishop. During the past 2 years, this expansion has been largely internal as a result of increased efficiency and extended processing and separation techniques.

With a more or less uniform daily consumption of about 200,000 gal. of propane and butanes for processing and 40,000,000 cu. ft. of fuel gas, the plant over the past 2 years has produced an ever wider range of petrochemicals in growing quantities. Output of the five principal products:

acetaldehyde, acetic acid, acetone, formaldehyde, and methanol, has been increased since 1948.

The primary oxidation reactions at the Celanese plant, carried out on propane, are:

$$C_3H_8 + 1/2\ O_2 = CH_3—CH_2—CH_2—OH + O_2$$

n-propyl alcohol

$$= CH_3—CH_2—CHO + H_2O + 1/2\ O_2$$

propionaldehyde water

$$= CH_3—CH_2—COOH$$

propionic acid

By eliminating one carbon atom from propyl radical, $CH_3—CH_2—CH_2—$, to form the ethyl radical $CH_3—CH_2—$, similar oxidation reactions produce ethyl alcohol, acetaldehyde, and acetic acid.

In another procedure acetic acid can be dehydrated to form acetic anhydride, a highly important intermediate in many chemical syntheses:

$$\underset{\text{(2 mols)}}{CH_3—COOH} + = \underset{\text{acetic anhydride}}{CH_3—CO\diagdown O\diagup CO—CH_3} + \underset{\text{water}}{H_2O}$$

$CH_3—COOH$ acetic acid

Propane can be oxidized to form dimethyl ketone (acetone):

$$CH_3—\overset{\overset{O}{\|}}{C}—CH_3$$

a very important solvent and chemical intermediate. Glycols may be formed, which are described as "dihydric alcohols," having two —OH or hydroxyl groups per molecule, such as $CH_2—CH_2—CH_3$, propylene glycol.

$$\begin{matrix} | & & | \\ HO & & OH \end{matrix}$$

As the molecular weight increases, the number of different derivatives possible increases rapidly.

Methylal, or dimethoxy-methane:

$$CH_3—O—\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}—O—CH_3$$

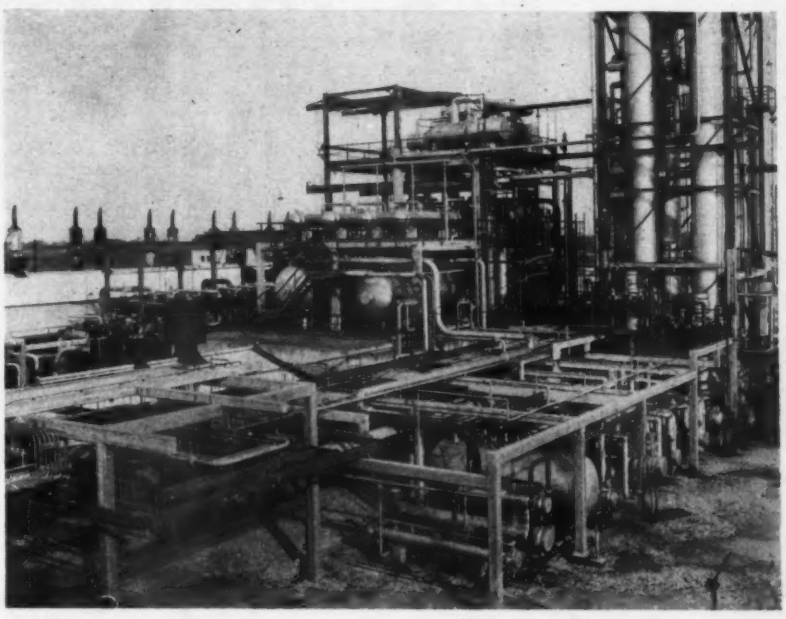
can be used as a solvent for special organic reactions, and in inks, coatings, plastics, and varnishes. It may be considered as the product of the formation of two molecules of methanol, $CH_3—OH$, followed by dehydrogenation with, and combination with, a methane, CH_4, molecule.

$$2\ CH_4 + O_2 = 2\ CH_3OH$$

$$2\ CH_3OH + CH_4$$

$$= CH_3—O—\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}—O—CH_3 + 2\ H_2$$

methylal



A general view of the purification section of the ethylene unit at Jefferson Chemical's Port Neches plant. In the far background is a portion of the compressor house and in the upper center is condenser structure, with the refrigerator condensers on top level.

It is also finding application as an ingredient or special fuel additive in aviation fuels for special engines.

In addition, other products synthesized in the oxidation process are being separated. These include some which are completely new to the chemical industry and some now available in new form.

Celanese is now the sole producer of propionaldehyde. Isobutyl alcohol has been in tank-car volume production for a year. The latter was available for years in small quantities as a byproduct of the fermentation process for methanol, but separation was difficult and the supply erratic. Now that it is in steady supply, demand for the chemical is increasing.

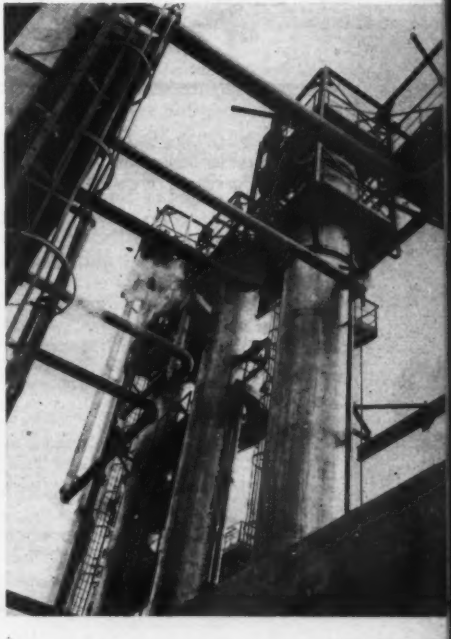
The most important new development at Chemcel is the commercial production of flake paraformaldehyde, a solid, 100 per cent concentration of the compound. Now available at less than half the price of powdered paraform, the only 100 per cent form previously available, this new product indicates a tremendous potential volume. The conventional 37 per cent water solution of formaldehyde is also produced in bulk and shipped from Corpus Christi to New Haven in 4,000,000-lb. cargo lots. Tank cars lined with phenolic resin move the product from Bishop to the nearby port, where it is pumped into stainless-steel tanks aboard a special tanker.

Two new glycols, propylene and dipropylene glycol, are now in production. Similar to ethylene glycol,

(Continued on page 305)

ARTICLE LISTING GULF COAST PETROCHEM PLANTS, LOCATIONS, AND PRODUCTS APPEARS ON PAGE 301.

These fractionating towers at the Jefferson Chemical plant separate ethylene oxide and ethylene glycol. Jefferson processes gas from nearby refinery of The Texas Co.



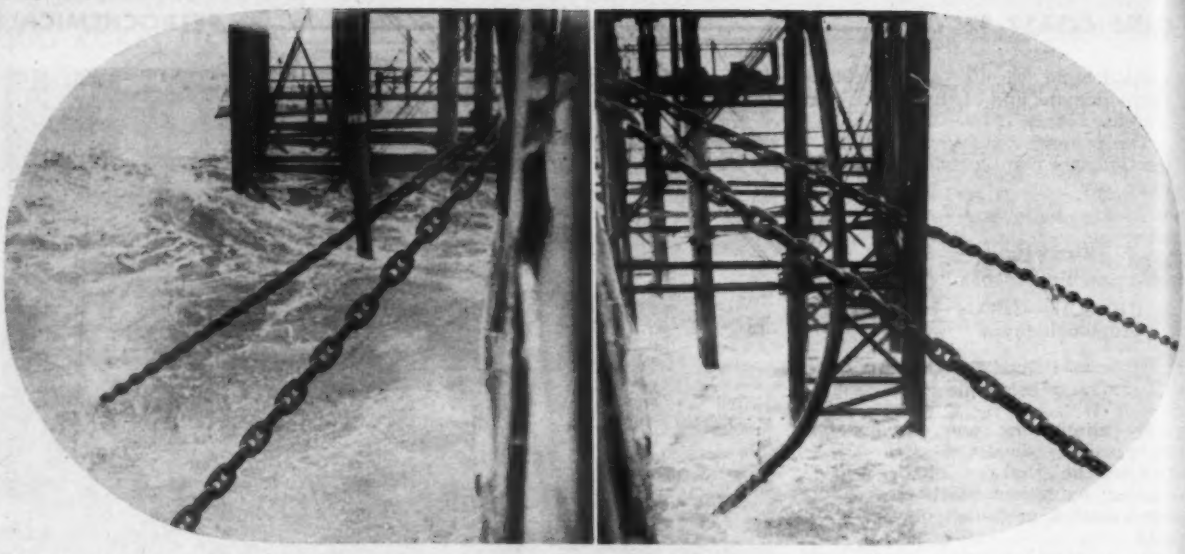


Fig. 1—(Left) Severe wave action affecting an offshore platform and tender. Note the wave crest commencing to top the horizontal bracing on the platform. Fig. 2—(Right) Photograph taken as a trough exposes lower horizontal bracing on the platform. Waves such as these have resulted in broken anchor chains and loss of bow ramps.

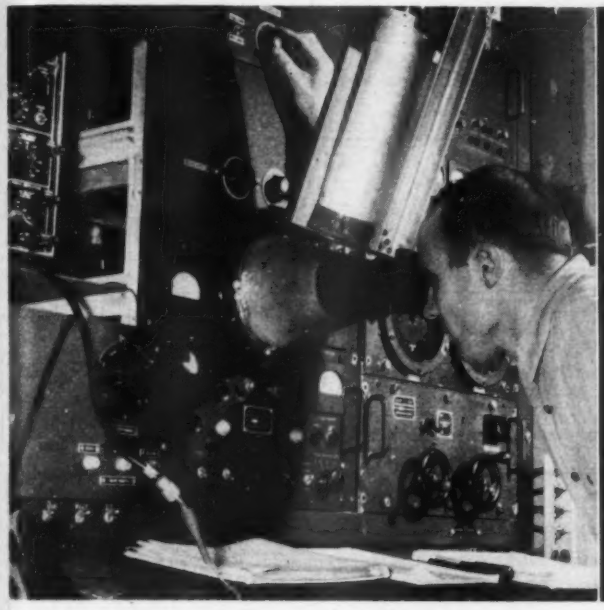
Wave, Tide, Current, and Hurricane Problems in Coastal Operations

by A. H. Glenn

"YEAR-ROUND" GOVERNMENTAL WEATHER OBSERVING FACILITIES ON THE GULF COAST BETWEEN BILOXI AND GALVESTON AND SUPPLEMENTARY FACILITIES OF OFFSHORE OPERATORS IN DELTA AREA (APRIL, 1950)
BEAUMONT
LAKE CHARLES UW
BATON ROUGE
BILOXI
HOUSTON UW
LAFAYETTE
UW US NEW ORLEANS
GALVESTON
LEGEND
GOVERNMENTAL FACILITIES
HOURLY OBSERVING STATION
6-HOURLY OBSERVING STATION
NOTE: THE NORMAL OPERATING RANGE (APPROX. 80 MILES) OF THE AIR FORCE RADAR AT BILOXI IS NOT SHOWN
OFFSHORE OPERATORS FACILITIES
OFFSHORE RIG OBSERVING WAVES, WIND, AND WEATHER ON 6-HOURLY SCHEDULE
LONG RANGE WEATHER RADAR AND OBSERVING STATION
NORMAL OPERATING RANGE OF WEATHER RADAR LOCATING SQUALLS, FRONTS, AND HURRICANES
ABANDONED RIG LOCATIONS FORMERLY REPORTING

Fig. 3—The inadequacy of governmental weather observing facilities along the Louisiana coast and the steps taken by offshore operators in the Delta area to fill in the existing "data gap" are indicated by this chart.

WHEN offshore operations were commenced and when inshore coastal drilling in relatively exposed waters was expanding during the immediate postwar years, it became evident to the oil industry that wave, tide, current, and hurricane conditions would have an important and occasionally critical effect on operating safety and efficiency.[1] Simultaneously, wartime development of certain techniques in the fields of meteorology (aircraft hurricane reconnaissance, radar, developments in tropical meteorology, and applied climatology), and oceanography (wave forecasting) impressed meteorologists acquainted



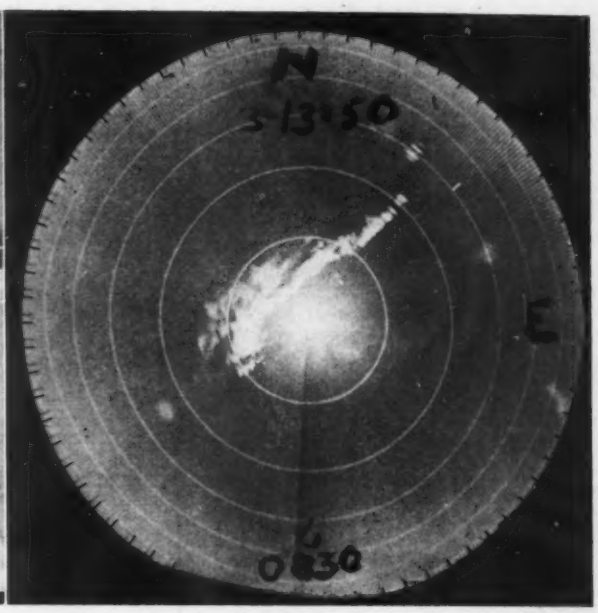


Fig. 4—(Left) Interior of the weather observing station at Grand Isle showing the meteorologist observing the "scope" on the control panel of the SCR-784 long-range weather radar. Fig. 5—(Right) A line squall appears on the radar scope. This squall extends 150 nautical miles northeast of Grand Isle and 75 miles southwest. Tracking of line squalls, cold fronts, and tropical squalls and disturbances by use of radar permits accurate warnings of their arrival at offshore rig locations enabling operators to take necessary precautions without unnecessary lost time.

with the oil industry that certain of the weather problems arising in oil operations were capable of solution.[2,3] As a result, an experimental program was inaugurated in 1947 by one company commencing offshore operations. The purpose was to ascertain the applicability of these scientific developments in reducing safety hazard and efficiency loss in offshore work.

One of the first problems approached was wave forecasting. Selection and adaptation of the wartime forecasting techniques most likely to prove applicable to conditions along the western gulf was carried out by Bates and Glenn.[4] Experimental wave forecasts were then prepared for the Grand Isle area and a detailed analysis of their accuracy was maintained by Graham and Thompson. In February 1948, the accuracy of the experimental forecasts having proved promising, a routine forecasting service for operational use in offshore work was established to test the value of the forecasts under actual field conditions.[5]

Sufficient experience with this service had been acquired by late 1948 to ascertain that it offered a substantial improvement in safety, savings in operating efficiency sufficiently great to justify the cost of the service, and a noticeable improvement in morale of crews through elimination of anxiety and erroneous decisions resulting from hysteria and rumor rampant during critical weather periods.

The service was expanded in early 1949 to include participation of all of the offshore operators in the Mississippi Delta area and has been continued on this basis since that time. While this service is continually undergoing adaptation to meet changing requirements, it is possible now to generalize concerning its utility in coastal oil operations in the light of 16 months' experience in handling the weather and wave problems of operators working offshore and along the coast with most of the existing types of installations and floating equipment and ranging in offshore operating scope from one rig to six.

The service as now operating involves three working facilities: a forecasting office in New Orleans; a coastal weather and wave observing network around the Mississippi Delta and a radar observing station at Grand Isle, La.; and a climatological office in Washington, D. C.

For maximum efficiency in forecasting for the western gulf, particularly during the hurricane season, it was necessary to situate the main forecasting office in New Orleans. New Orleans is the communications center for governmental weather data pertaining to the western gulf. For example, the observations relayed by radio from reconnaissance aircraft in hurricanes are usually received 15 minutes to a half hour after made by the CAA radio facility, WEK, at the New Orleans airport. They are subsequently relayed over some of the government weather teletype circuits and the priority they are assigned in communication over these crowded circuits depends on their urgency in forecasting in the particular area the circuit covers. Thus, New Orleans, being the hurricane center for the western gulf, has prior-

The Author

A. H. Glenn is director of A. H. Glenn & Associates, consultants in meteorology and oceanography, with offices in New Orleans, Washington, D. C., and Grand Isle, La. He received his B.S. in civil engineering at University of Wisconsin, M.S. in meteorology at New York University, and did graduate work in oceanography at University of California at Los Angeles. During the war Glenn served as captain in the U.S.A.F., and engaged in research in tropical meteorology, aircraft weather reconnaissance, and weather and wave forecasting for Air Force and Navy construction and combat operations in the Pacific theaters. As meteorologist with the U.S.A.F. after the war, he engaged in specialized climatological investigations for air and amphibious operations.

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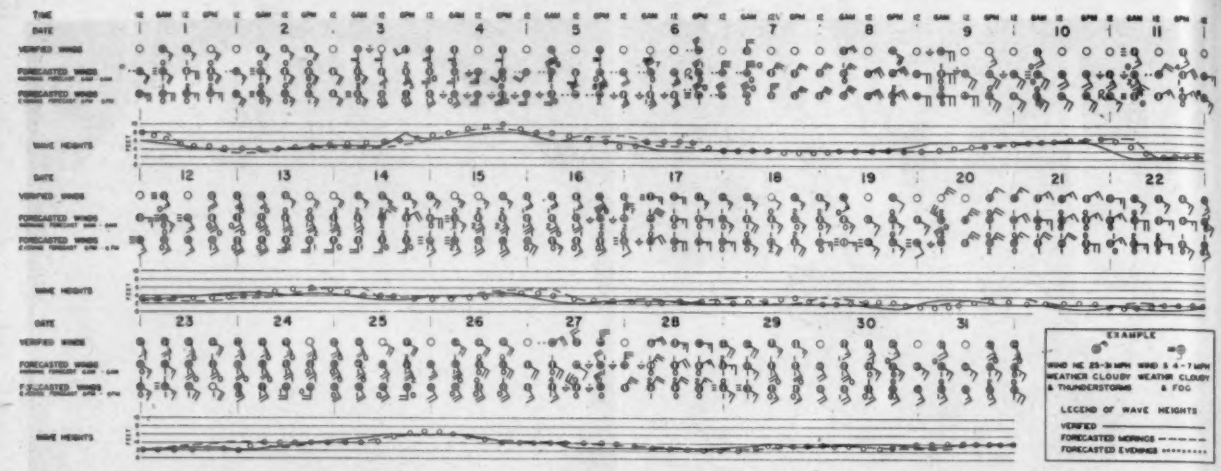
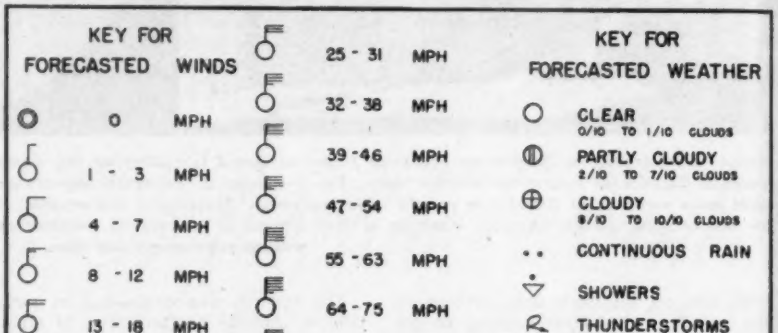


Fig. 6—The accuracy of forecasts is indicated by showing observed (verified) wave and wind conditions and forecasted conditions 6, 12, 18, and 24 hours in advance at an offshore location in the Delta area during a winter month.



ity in handling of these reports and this means an improvement in time of receipt by as much as several hours. For reasons such as this the forecasting office was established in the New Orleans airport, equipped with complete governmental weather teletype facilities, and staffed with a group of professional meteorologists adequate to handle round-the-clock forecasting during severe weather situations and a 15-hour per day routine forecasting service.

The necessity for augmenting governmental weather facilities with a coastal wave and weather reporting network (Fig. 3) and a radar observing station (Fig. 4) is fivefold. First, with the exception of a 6-hourly reporting station at Burrwood, there are no year-round governmental weather facilities on the Louisiana coast, making it the most vulnerable coastal region of the United States, meteorologically speaking. Governmental weather observing facilities on the Louisiana coast are grossly inadequate to permit the order of accuracy in forecasting required in offshore operations.

Second, any forecasting project, particularly wave forecasting, is in certain aspects a research problem and detailed analysis of the local characteristics of large-scale weather and wave phenomena is essential in improving accuracy. For example, using the wartime techniques in forecasting waves in the Main Pass offshore field results in systematic gross error which was eliminated through empirical corrections possible after analysis of observations made at the rigs in this field.

Third, careful observing by company personnel of wave and wind conditions with simultaneous observations of equipment operation is necessary in order to make use of the forecasts. It is of no value, obviously, for operating personnel to obtain accurate wave and wind information without a quantitative understanding of how equipment performs (Table 1) under various sea conditions.

Fourth, it is essential that an objective, detailed analysis of forecasting accuracy be maintained to evaluate the accuracy of forecasts.

Fifth, observations received from rigs are frequently used in the actual preparation of forecasts. For example, when severe line squalls (Fig. 5) sweep into the delta area, the first warning is based on radar tracking of the squall and evaluation of the intensity of the surface winds from a number of general considerations (extent of cold advection and strength of winds aloft, reports from governmental observing stations inland, radar echo intensity, precipitation intensity, etc.). However, in some cases important revision of the initial warnings is based on reports from the rigs. An example was the severe line squall of May 24, 1949, which hit Main Pass field with 70-m.p.h. winds and shut down operations in the field for about an hour. Warning of this squall was based on radar tracking and rig reports received from Breton Sound field.

The necessity for maintenance of a climatological office in Washington, D. C., arises from the fact many climatological data on weather, waves, currents, etc., are on file in various Washington agencies (U. S. Weather Bureau, Air Force, Navy Aerology and Hydrographic offices, Army Quartermaster Corps, National Archives, U. S. Coast and Geodetic Survey, etc.) or at the Weather Bureau-Air Force-Navy climatological library in New Orleans. Since forecasting or design problems for any location require assembling all pertaining climatological data as background material, availability to these data sources is essential.

Utilizing these three working facilities, the service now provided the offshore operators consists of the provision twice daily of routine wave, wind, and weather forecasts for specific locations for the period 0 to 48 hours in advance; the provision of specialized advisories developed by Shisler[17] concerning all hurricanes, tropical storms, or tropical low-pressure areas from which either of these severe storms may develop; and the

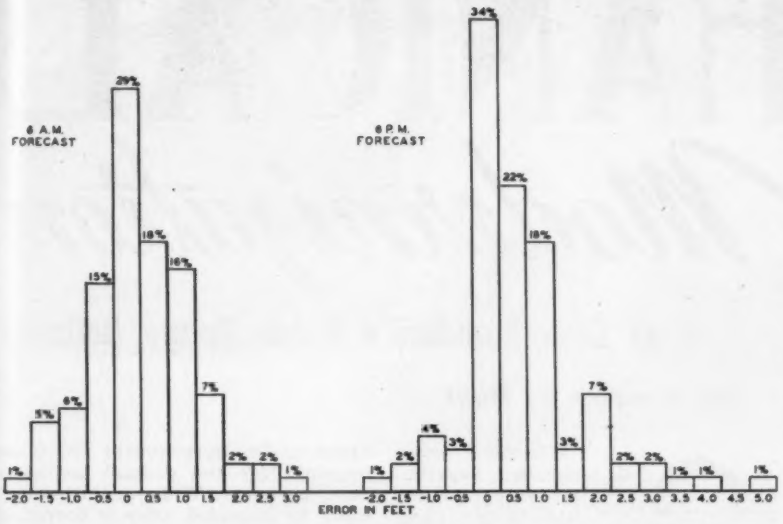


Fig. 7—By analysis of the observed and forecasted wave conditions such as shown in Fig. 6, detailed summaries of the accuracy of forecasts shown above are possible. November 1948 is selected as a month when forecast accuracy was relatively low.

availability of the meteorologists for discussion of problems in which weather and waves are a factor. It has been found that most of the important contributions this service has made in improving safety and efficiency have not been based on prepared forecasts, but on verbal discussions (Table 2). Company personnel making decisions in which weather is important much prefer to discuss the matter with the meteorologists, who are acquainted with the operations and the company personnel, than to rely on a formal written advisory or forecast. This universal feeling was succinctly expressed by one superintendent during the September 3-4, 1949, tropical storm that affected the delta area. On being called at his home by one of the meteorologists and informed of an advisory concerning the tropical storm which was forming in the gulf he answered, "Never mind, the advisory, give me the dope!"

Consider a specific weather situation in which safety was the primary factor. One of the most intense low-pressure areas ever to affect the Central United States moved into eastern Colorado on the morning of March 26, 1950. As it intensified, it became evident that extremely high southerly swells would affect offshore locations exposed to the south within 18 hours.

At about 8 a.m. superintendents of two companies concerned were notified that swells reaching 15 ft. in height could be expected by the morning of March 27. After discussion of the situation, it was decided to move barges out of the gulf to safe harbor and at the most exposed location the ramp between tender and platform was removed and the tender moved back from the platform to avoid ramming.

Waves reached a maximum of 15 ft. in late evening of March 26. Analyzing the midnight maps during the early morning of March 27, it was evident to the meteorologists that a phenomenal intensification of this low-pressure area was taking place over the central states and a continued rise in swells could be expected during the morning. Superintendents of the companies concerned were notified at 4 a.m. March 27 of this fact and additional precautions were taken including moving tenders away from platforms at some of the less-exposed locations.

Waves reached a maximum of 25 ft. at about noon, March 27, when the tenders experienced sufficient pitch to take green water over the bow. These waves were equivalent in height to those of the tropical storm of September 3-4, 1949, and the hurricane of September 3-4, 1948, yet damage sustained by these two companies was minor.

In this storm, one company advised estimated definite savings of about $5,000 in avoiding barges broken loose and grounded and possible greater savings in avoidance of loss of ramps or tender damage as ramps broke loose. But, needless to say, the most important and intangible value of such a warning is in avoidance of crews being caught in a hazardous situation.

The weather situations that present the most serious menace to offshore and coastal operations are hurricanes, tropical storms, line squalls, "northers," and sustained periods of strong southerly winds causing high swells. Adequate safety warnings are being provided in practically all "norther" situations, and periods of southerly swells. Using radar, 1 to 3 hours' definite warning is possible in severe (50 to 75-m.p.h. winds) line-squall situations, and to date warnings have been issued by this service on all tropical disturbances affecting the western gulf, including those of September 12-13, 1948, and September 3-4, 1949, which were overlooked in the "official" advisories.

Turning to more frequent situations when efficiency alone is involved, use of this service as contrasted to use of the generalized governmental service has resulted in frequent sizable savings. There are many cases indicating this which are on record, such as those outlined by Graham and Geyer[4] in which a total of $25,000 was saved in 12 weather situations through improved efficiency resulting from this service, and those referred to by Pennington and Posgate.[5] With the exception of the annual efficiency problem of whether and when to evacuate coastal drilling rigs, and how soon to return, no two cases are alike. The frequency with which these efficiency problems arise is indicated by Table 2.

Abnormally Low Tides

Consider one of many cases which illustrates the use of the service in improved efficiency in planning work. A barge drilling job was involved. During November 1949 persistent northerly winds resulted in abnormally low tides in coastal Louisiana. A company moved a contract rig onto a wildcat location when tidal level was normal and wished to abandon the location in November. The low water prevented floating the barge free and attempts to lighten it were to no avail. It was obvious that a rise in tidal level was required. Rather than hold a spud barge, dragline, and several tugs on per hour rental until the required rise occurred, the meteorologists were requested to inform the superintendent 24 hours in advance when a period of winds sufficient to raise the water level approximately 1 ft. could be expected. The meteorologists commenced correlation of winds and tide anomaly at several tide gages in the delta area and, making use of data described later, when the first period of winds of required strength and direction was anticipated, equipment was moved to the location and the barge was pulled free. It was estimated that several days of standby time with this equipment were avoided.

In planning work on the basis of meteorological information, the same question arises which was asked when geology and geophysics were first introduced into oil operations. since the meteorologist, like the geologist

(Continued on page 320)

XUM

MECHANICAL *Modernization*

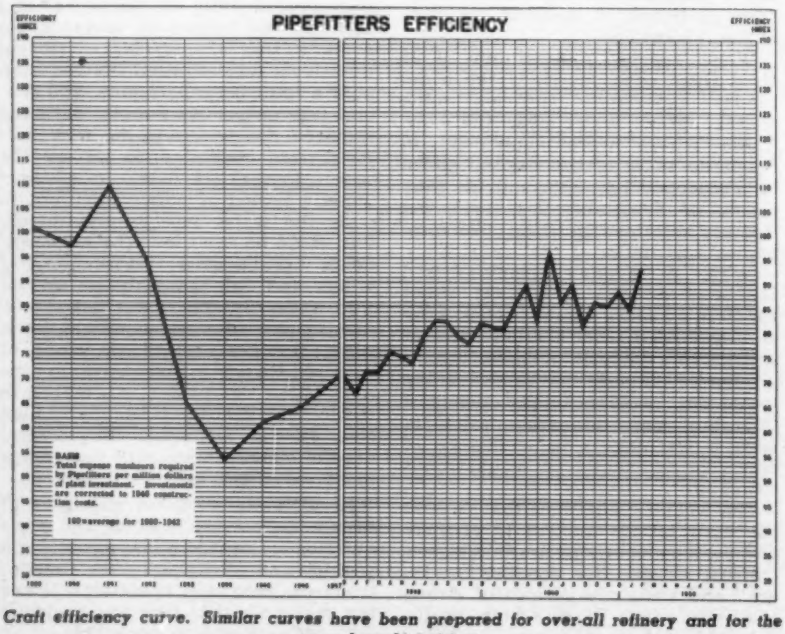
at Esso Standard's Baton Rouge Refinery

by Charles P. Hoyt

FOLLOWING the war many petroleum refineries having modern and efficient process facilities realized that their maintenance equipment and methods had become antiquated and inefficient. Among these was Esso Standard's large Baton Rouge refinery. This 235,000-bbl. per day refinery, with 7,700 employes, makes 700 different petroleum and chemical products. The annual bill for maintenance and miscellaneous construction amounts to many millions of dollars. Expenditures of this magnitude warrant careful and complete periodic reviews to insure that the techniques employed are the most economical for the purpose. Such a review was undertaken by Esso in 1945, with the result that a mechanical modernization program costing in excess of $7,000,000 was inaugurated. It is estimated that the program will pay for itself 3 years after completion.

Charles P. Hoyt, assistant superintendent, mechanical division, Baton Rouge refinery, Esso Standard Oil Co., was born in Philadelphia in 1906. He graduated from Lafayette College with a B.S. degree in mechanical engineering in 1929. Following his graduation, he was employed by Standard Oil Co. (N. J.) as a student engineer. On September 1, 1929, he was transferred to Standard Oil Development Co. as an inspector for the general engineering department. While in this assignment, he inspected refinery operating equipment of all domestic affiliates. In October 1933 he transferred to the Baton Rouge Refinery of Esso Standard Oil Co., as an engineer in the inspection department. Since that time, he has served as chief inspector, head of the maintenance and construction department, and in his present position. In his previous assignment, he was active in initiating the mechanical modernization program and latterly he has spent much time administering this program.

The basic principles of this program were to: (1) establish a well-defined mechanical organization with definitely assigned responsibilities for performing all functions directly associated with maintenance and construction work, (2) provide for effective planning and control of all mechanical work, (3) install a comprehensive training program for all personnel, (4) design future and alter present refinery equipment for minimum maintenance, and (5) provide adequate mechanical facilities.


PIPEFITTERS EFFICIENCY
EFFICIENCY INDEX
BASIS
Total expense manhours required by Pipefitters per million dollars of plant investment. Investments are corrected to 1946 construction costs.
100=average for 1939-1942

Craft efficiency curve. Similar curves have been prepared for over-all refinery and for the several work divisions.

Organization

It was concluded that the mechanical division should include only such groups as were necessary to design, construct, and maintain refinery equipment efficiently. Therefore, three departments were established; namely, mechanical engineering, stores, and maintenance and construction.

The mechanical engineering department is responsible for mechanical and electrical design work and related engineering activities. The stores department is responsible for requisitioning, warehousing, and issuing all

MODERNIZED EQUIPMENT ACTIVITY.—THIS MOBILE POWER EQUIPMENT SPEEDS CONSTRUCTION-MAINTENANCE OPERATIONS.

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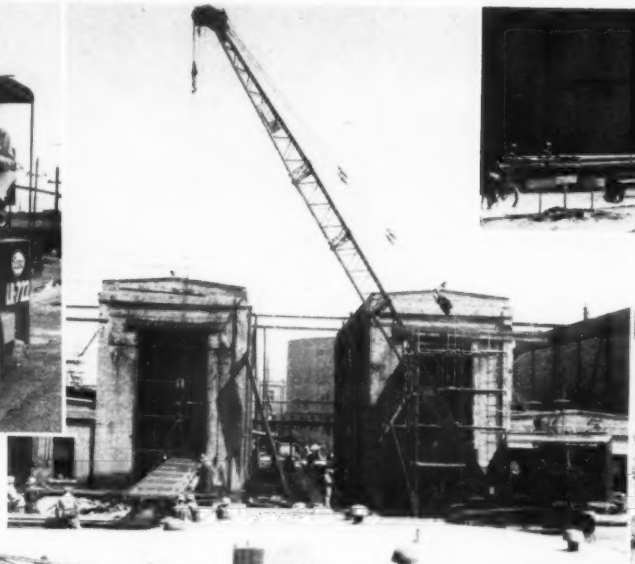

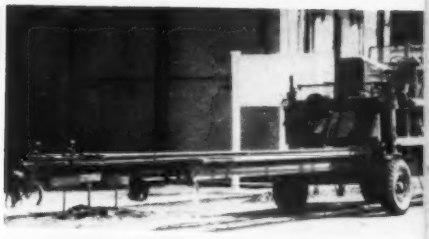

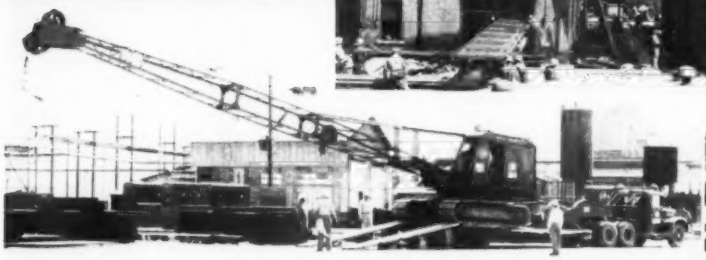

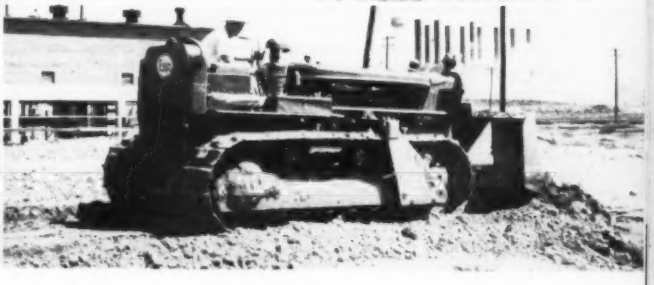

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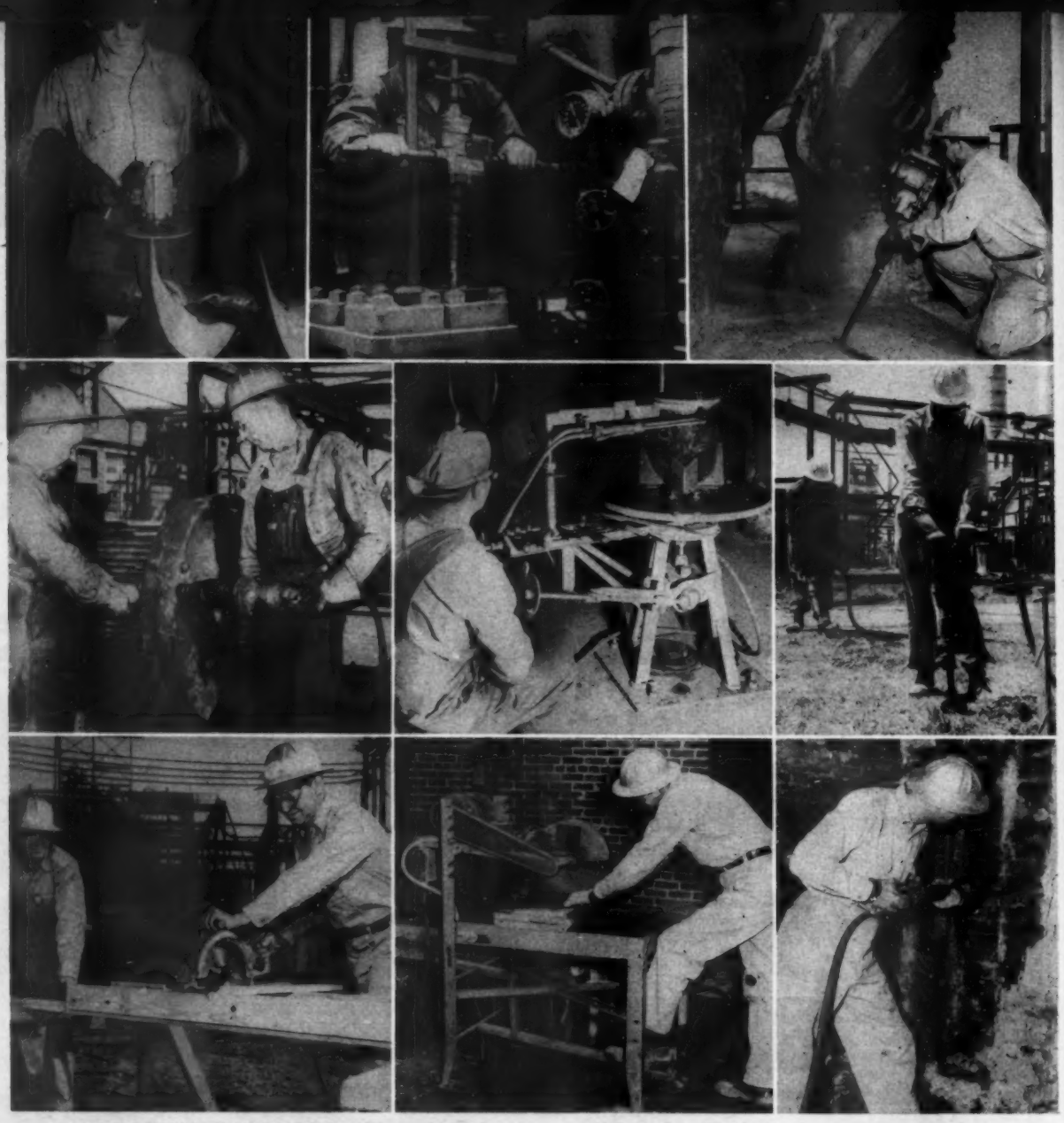

POWER TOOLS OF MANY KINDS.—This equipment speeds many jobs for Esso Standard's manufacturing department.

materials required for maintenance and construction activities, as well as for the operation of the reclamation and central tool control groups. The maintenance and construction department has as its primary responsibility the performing of mechanical work in the field.

The organization of the maintenance and construction department is based upon: (1) centralized control of all crafts and grouping all related crafts into several mechanical craft divisions, (2) grouping of process units into refinery work divisions and coordinating the work within and between these divisions, (3) effective planning and control of all mechanical work. The activities of this department are divided into three groups, each being supervised by an assistant head of the department. These three groups are crafts, field coordination, and office and planning.

The crafts group includes the bulk of the employes of the department and is made up of nine craft divisions. There are some 20 different crafts required in the work of the department and the craft divisions embrace in many cases a number of like crafts. For example, the boilermaker division includes the boilermakers, burners, welders, blacksmiths, lead burners, and tinners crafts. Each of the nine craft divisions is supervised by a general foreman. Under the general foreman there are second line foremen who are assigned to the refinery work divisions as described below. These foremen in turn supervise first-line foremen who have the direct responsibility for the hourly paid workers.

The functions of the field coordination group can probably best be understood by describing the manner in which the maintenance and construction organization ties in with that of other departments. Because of the size of the refinery and the magnitude of the operations, five refinery working divisions were established. Three of these divisions consist of plant process operating facilities, another covers shop operations, and the fifth handles large construction projects. The first three working divisions are arranged according to process operations and other considerations rather than on a geographical area basis.

Each of the five divisions is super-

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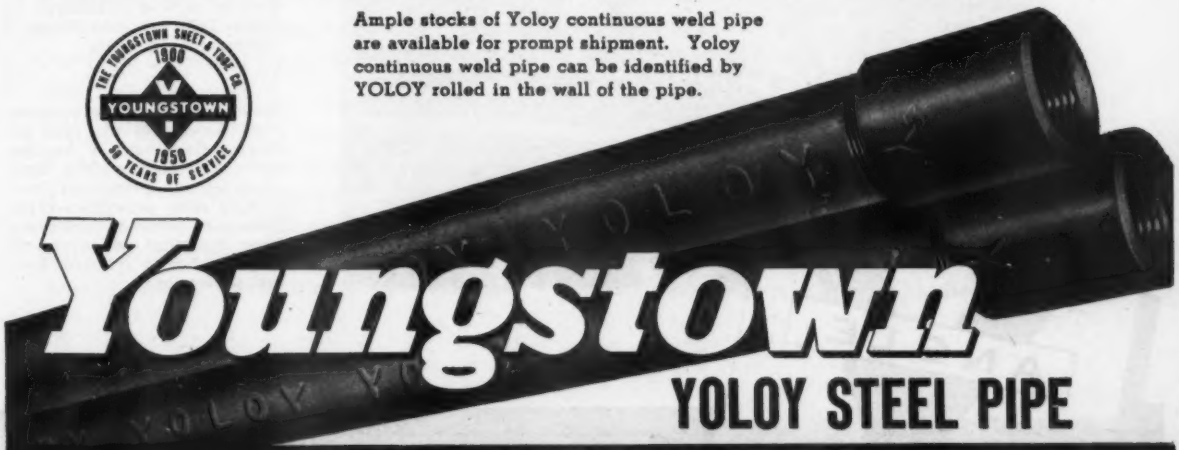
Yoloy continuous weld pipe installed in brine lines from the wells at a salt plant is still in service after several years. Pipe previously used in this same line had to be replaced 3 or 4 times a year.

Other examples of the unusual service given by Yoloy pipe can be cited. For further information, write or phone the Youngstown District Sales Office nearest you.

Ample stocks of Yoloy continuous weld pipe are available for prompt shipment. Yoloy continuous weld pipe can be identified by YOLOY rolled in the wall of the pipe.



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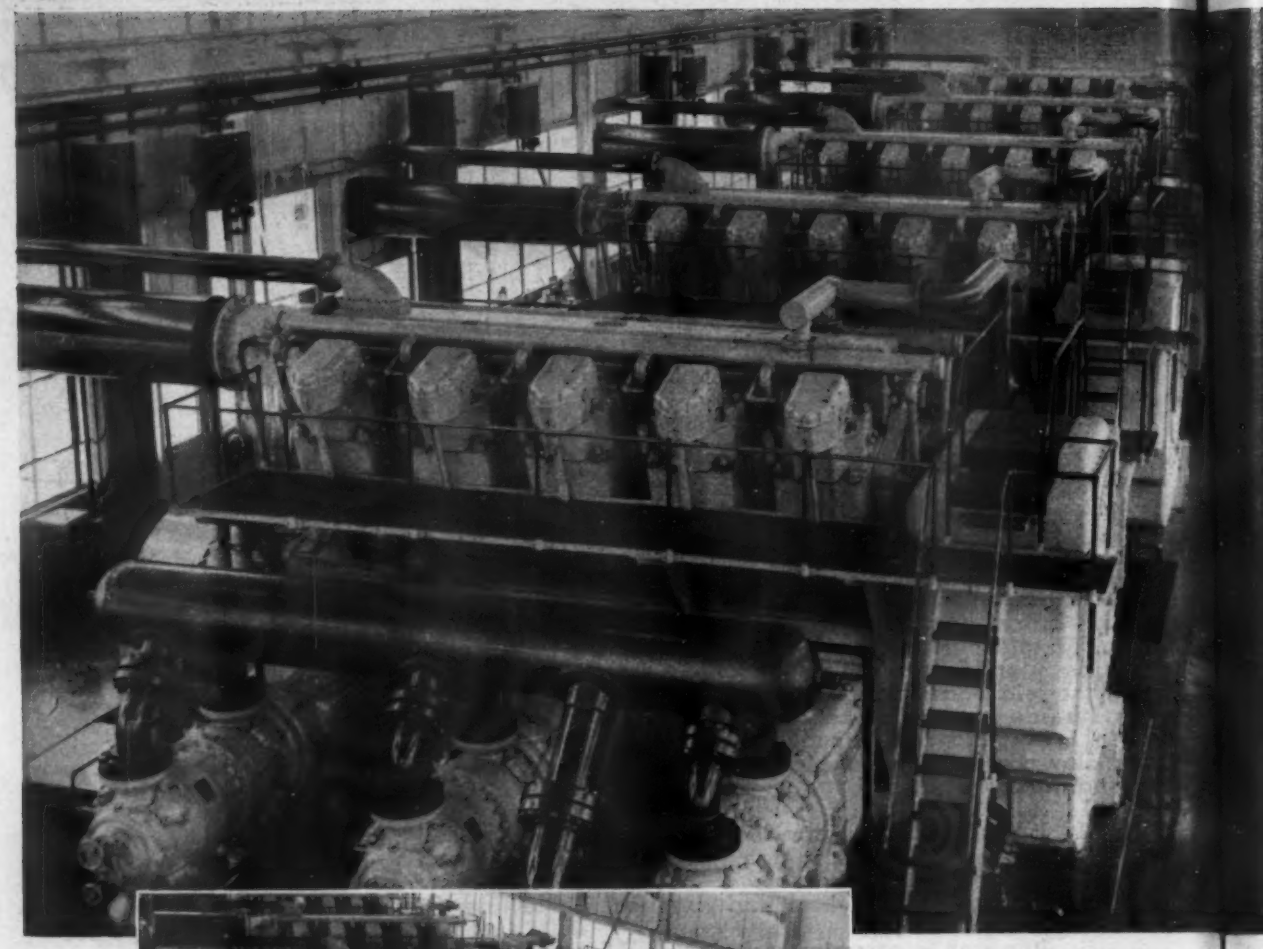

Above: Five of the Cooper-Bessemer GMW engine-driven compressors in Michigan-Wisconsin Pipe Line Company's Guymon-Hugoton Station, showing units from scavenging, blower end. Each has 10 V-type power cylinders, is rated 2500 hp, and drives 3 compressor cylinders.

Shown here from the opposite end, these GMW's, like all Cooper-Bessemer V-angles, feature rigid, one-piece base construction, articulated connecting rods, precision-type, extra-area bearings, and many other important advancements that add up to reliable, low-cost performance.

ANGLE

Compressors

New York Washington Bradford, Pa. Parkersburg, W. Va. San Francisco, Cal. Seattle, Wash

Another Example of Efficient Power at Lower Cost

Shown opposite are five of the Cooper-Bessemer GMW V-angle compressors now at work in the new Guymon-Hugoton Gas Field Station of the Michigan-Wisconsin Pipe Line Company.

Despite the relatively small space they occupy, these five units alone provide a total of 19,200 compressor horsepower! It shows that *big* savings can be made today in the cost of foundations, buildings and installation by taking advantage of the extreme compactness, the high power-to-space ratio of these modern V-angles.

But of course that's not all. By meeting power needs with fewer, more compact units, there's also a sizeable, long-range saving in maintenance, personnel and overall operating cost. What's more, years of field experience prove that you can always count on Cooper-Bessemer V-angles . . . GMW's, GMV's, and GMX's . . . for continuous compressor performance at its trouble-free best.

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Left: Interior view of new centralized shops; in top of photo is seen the balcony lunch area for employes. Right: Here are two of the mobile power machines employed within the shop building.

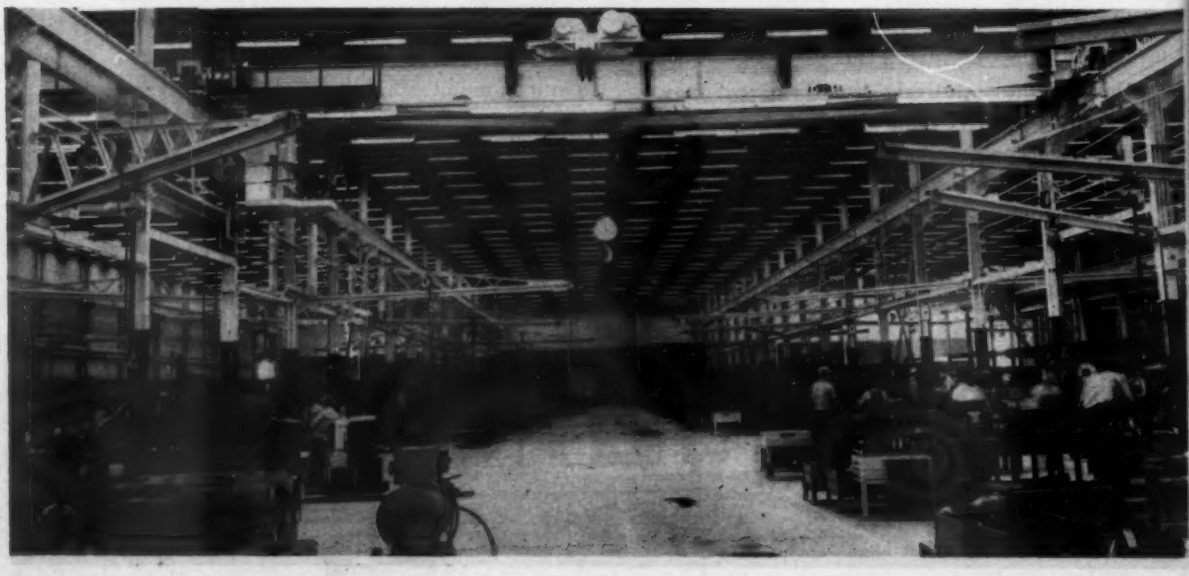
vised by a division engineer. The divisions consist of 5 to 10 sections or work zones, with a maintenance and construction (M. and C.) engineer coordinating the work in each zone. Assigned to each division engineer are second-line craft foremen who, with the first-line foremen, are responsible for the actual performance of the work. While the engineers do not handle personnel matters for the crafts, they are responsible for scheduling the work and for the cost of mechanical operations in their respective sections. Personnel matters are handled by first-line foremen and their district superiors. With this arrangement the division engineer and the second-line foremen assigned to him form a team for executing the mechanical work in each of the work divisions. The M. and C. engineers then work with the first-line craft supervisors to execute specific jobs in their assigned areas.

The office and planning section of the maintenance and construction department consists of three groups: planning and statistical, office, and turnaround coordination. The planning and statistical group is in charge of long-range planning for the department and also assists in daily job planning and other activities in the refinery work divisions. The office group has the responsibility for providing clerical and stenographic assistance for the entire maintenance and construction department.

The turnaround coordination group assists the M. and C. engineers in handling heavy work loads during process unit turnarounds and other major jobs. This group arranges for

(Continued on page 294)

Mid interior view of the 236 by 600-ft. $3,000,000 central mechanical building. Completely air-conditioned, the fans circulate 300,000 cu. ft. of air per minute, which is cooled by 1,100 tons of refrigeration; lighting intensity throughout is provided by 2,500 fluorescent lights.



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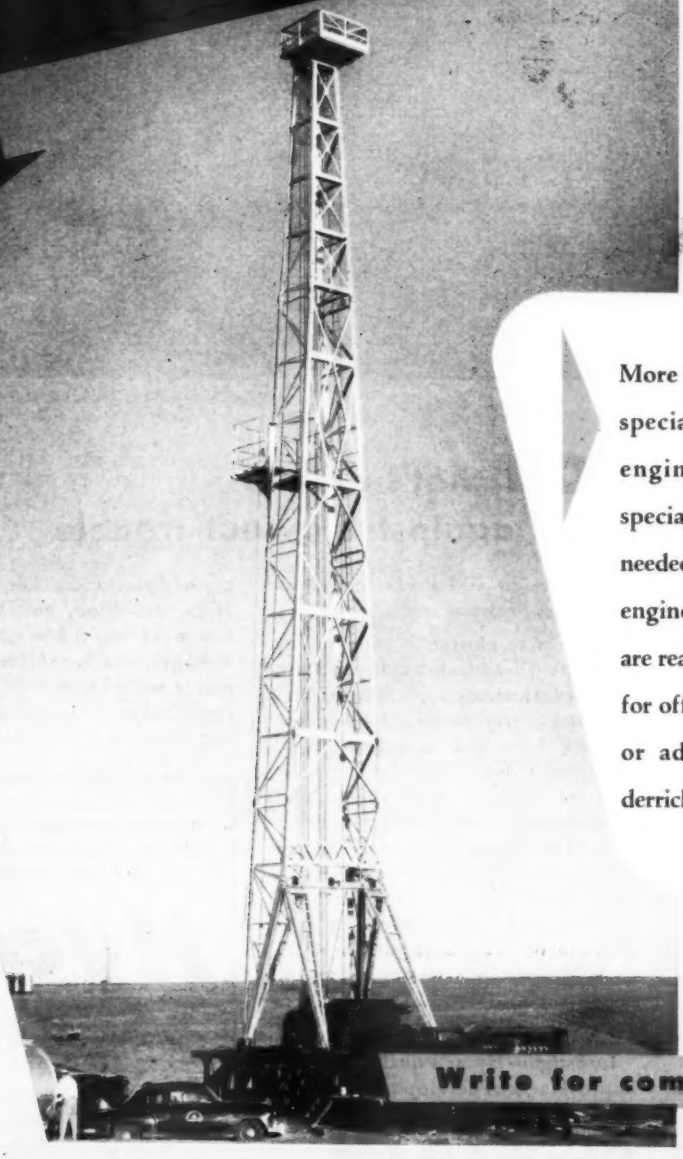

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GULF COAST AREA KEEPS ABREAST OF TECHNOLOGICAL PROGRESS THROUGH *Research activity*

Front entrance to The Texas Co.'s geophysical research laboratories at Bellaire (Houston suburb).

by Emory N. Kemler

THE general development of research activities on the Gulf Coast has closely paralleled the industrial development in this area. The area has been concerned with the exploitation of its natural resources with primary emphasis to date on oil and agriculture. The exploitation of another of its natural resources, the Gulf of Mexico, can be expected to go ahead in a major way as soon as enough factual information is obtained and assimulated on this great important regional resource. The wealth of this area has come primarily from the development of these resources, and to date has been primarily concerned with their sale as a raw product. Much concern has been expressed about this one-way process of using up our irreplaceable resources. Where this process is not accompanied by an ever-improving technology, such concern is probably justified.

Natural resources are largely exported from the region in the form of raw products. Other areas take these raw products and through manufacturing and processing add a value generally several times that of the raw resources. As long as the relative profits from the exploitation of the resources exceed the profits which can be obtained from the processing of the resources, we can expect major emphasis in the region on exploitation. As exploitation costs increase, wildcatting operations become more uncertain, production costs increase, and markets increase more slowly, the trend will be toward the development of more complete processing facilities in the region. This will first take the form of preliminary processing such as is done in many of the chemical plants which are currently being developed in this area. The future will see more rapid development in this direction.

Most of the new plants are owned by large corporations or their subsidiaries. The research and development which were necessary to arrive at a valuable process were mostly done at their research laboratories generally located in other areas. The location of the plant in the region is basically a matter of economics rather than an interest in regional development or serving a regional market.

One of the advantages which this area has for development of processing plants is a climate which permits low-cost factory buildings, together with low operating cost. Another is an abundance of gas fuel which is not only a cheap fuel but also is much simpler to handle and reduces the costs of many processes involving high energy requirements. The disadvantages of the region, insofar as locating of end products plants here, are the small local market and a high cost of transportation to the large consuming areas of the nation.

Natural Advantages

Development of the Gulf Coast shipping industry is a great advantage in serving the large eastern seaboard market and the foreign market. It will undoubtedly be a major factor in future developments of the region. Improved shipping facilities will accelerate the development of more complete processing facilities for the local raw products. This combination of cheap water transportation and cheap fuel has also resulted in location of facilities for processing imported raw materials.

(Continued on page 287)

The Author

The author is associate director of Southwest Research Institute, Houston. Kemler was born in Basehor, Kans., July 21, 1905. He attended University of Kansas, receiving the bachelor of science in mechanical engineering (1927) and mechanical engineering degrees (1932), and University of Pittsburgh, from which he received master of science (1931) and Ph.D. degrees (1934). He has been associated with several companies and institutions, including Dodge Manufacturing Corp., University of Pittsburgh, Gulf Research & Development Corp., and the Gypsy Division of Gulf Oil Corp. Later he was professor of mechanical engineering at Purdue University, head of the engineering research division, Southern Research Division, and professor of mechanical engineering at New York University.

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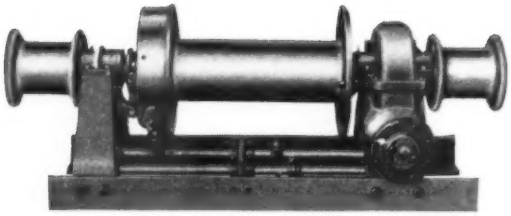

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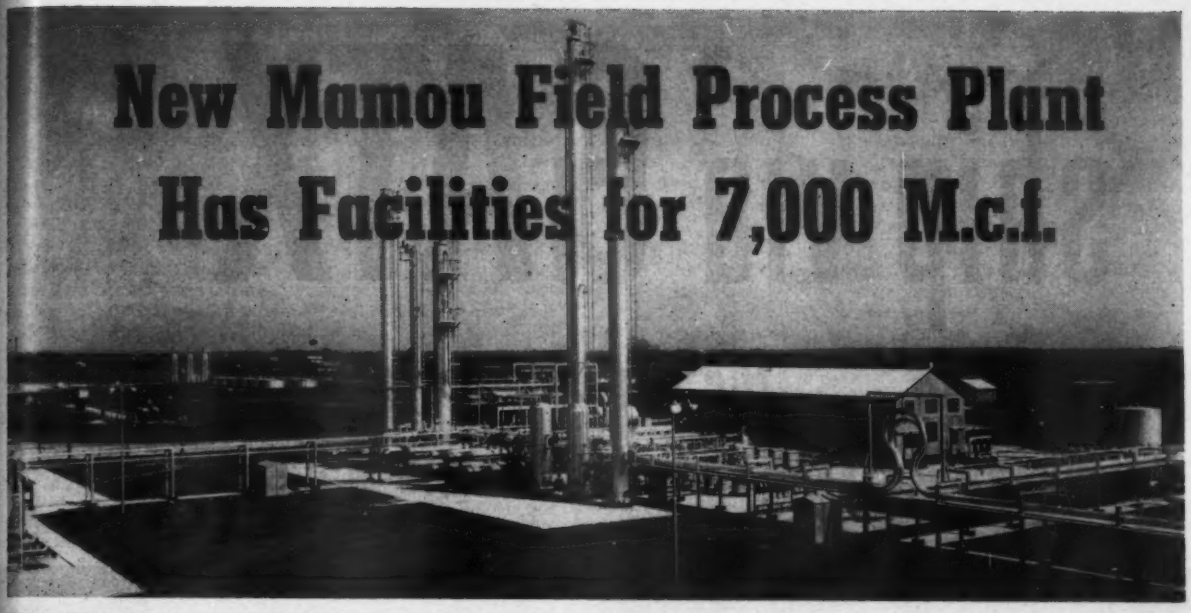

NEW GULF COAST GAS-PROCESSING PLANT.—This broadside view taken by the Journal's field photographer shows new Magnolia Co. plant located in Evangeline Parish, Louisiana.

by Brunner C. Barnes*

MAGNOLIA PETROLEUM CO. has installed a process plant in Mamou field, Evangeline Parish, Louisiana, to process oil-well gas produced in this field. The plant is designed to gather oil-well gas from a central field-separator battery operating at about atmospheric pressure, compress this gas in two stages to 300 psig. for processing, and then compress process residue gas in one stage to 1,000 psig. for sale.

Process facilities are designed to handle 7,000 M.c.f. per day of oil-well gas at full load with a design extraction efficiency during summer months of 45 per cent for propane and 95 per cent for butanes from the feed stream. Compressors are sized to handle the full 7,000-M.c.f. per day design wet-gas load. The plant is capable of recovering an L.P.G. product whose vapor pressure is in the 80 to 150-lb. range in addition to a natural-gasoline product of a 14 to 26-lb. R.v.p. range.

The plant is located on a 15-acre site 1.3 miles east of Mamou, La. The town of Mamou is on Louisiana State Highway No. 26, and is also served by the Rock Island Railroad. A rail-loading rack with leadout lines is provided for rail movement of products. A truck-loading rack has been constructed at the plant site for loading of products for highway movement. An office, warehouse, and small shop are provided at the plant site.

Oil wells in Mamou field are produced into a central separator battery located adjacent to the plant site. Separator pressure is controlled at about atmospheric pressure, resulting in the recovery of a fairly stable stock-tank oil. This procedure insures a low vapor loss from the crude oil in storage and transit.

Use of the centralized battery reduces the length of gas gathering lines to a minimum, and also simplifies the oil-gas separation problem for the field. At the central battery, heater-treaters are used to treat the crude oil.

Processing Steps

A brief discussion of the various process steps follows. In general, the process employed is a straightforward absorption-distillation-fractionation cycle. In several operations the process has been adapted to utilize idle equipment available for installation in this plant.

1. Absorption.—The main gas stream from the compressor station at 300 psig. is contacted in the main absorber with a proportionally controlled volume of lean absorption oil. The stripped residue gas from the absorber passes through the absorber residue scrubber to the sales-gas compressor suction for delivery to sales-gas pressure.

2. Rich-oil contactor - reabsorber.—The total rich-oil stream from the main absorber flows to the mid-section of the rich-oil contactor-reabsorber tower operating at a pressure of about 65 psig. Uncondensed overhead still vapors from the raw-gasoline surge tank enter the base of the rich-oil contactor section. The stripping action of these vapors reduce the methane and ethane content of the rich oil leaving the contactor section, while propane and heavier components in the raw surge tank vapor stream are concentrated in the rich oil. Flashed vapors from the entering rich oil and uncondensed stripping vapors from the contactor section join to flow to the reabsorber.

Lean oil is pumped over the reabsorber section at a rate proportional to the reabsorber residue gas volume. This ratio is set so that propane lost to the residue-gas stream will be at a low value, while butane-and-heavier loss will be negligible. Rich oil from the reabsorber section joins the main flashed rich-oil stream as the total rich-oil feed to the contactor section.

3. Distillation.—Rich oil from the contactor - reabsorber is pumped through lean oil-rich oil heat exchangers, through a direct-fired heater, into the single still operating at about 75 psig. Steam is exhausted from reciprocating process pumps at a sufficient back pressure to feed into the still for stripping requirements. Stripped lean oil from the still is cooled by exchange in the oil exchangers and then by cooling-tower water in lean-oil coolers. Lean-oil pumps take suction from the lean-oil surge tank operating at a pressure of 50 psig.

Overhead vapors off the still pass to the primary gasoline condenser where reflux for the still is condensed. The still overhead product then passes to the secondary gasoline condenser

*Natural-gas department, Magnolia Petroleum Co.

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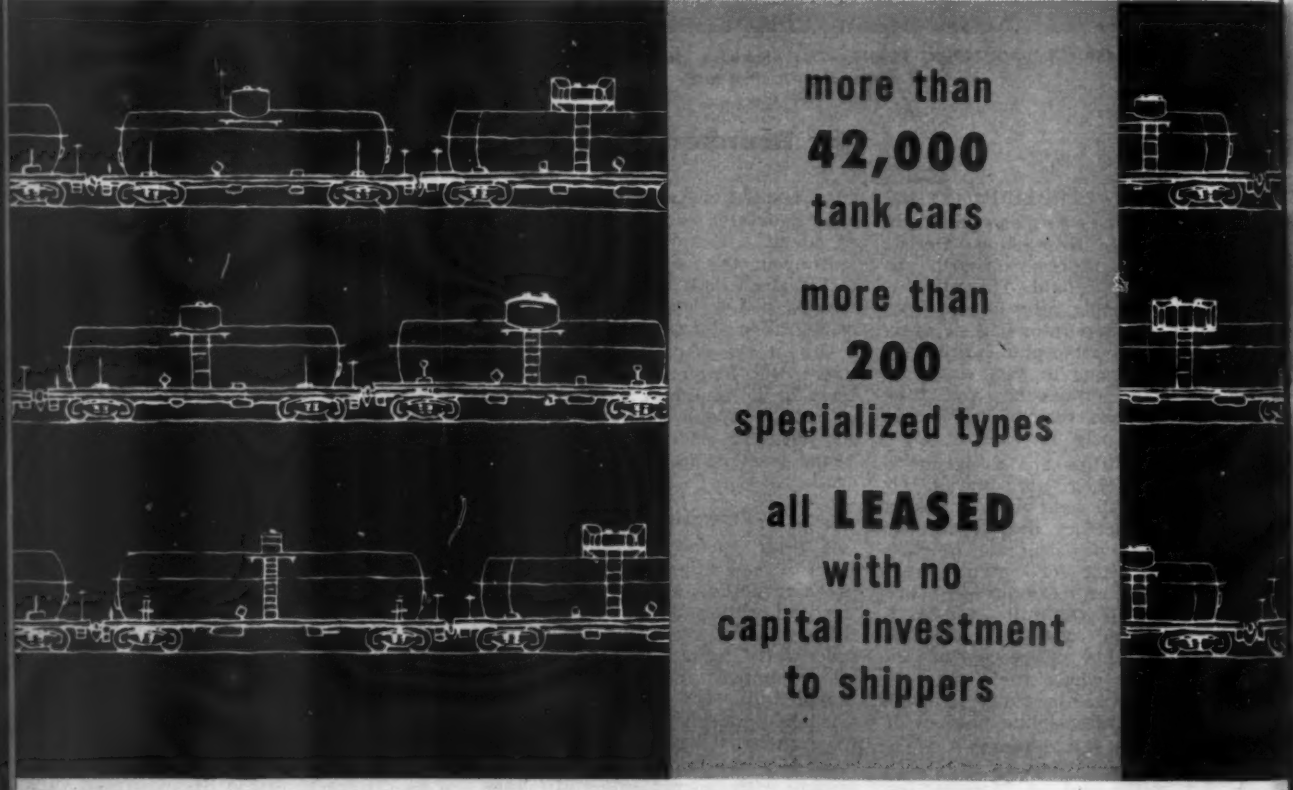

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for final cooling and condensation. The raw-feed gasoline product is accumulated in the raw-feed surge tank for fractionation into salable liquid products while uncondensed still vapors return to the base of the rich-oil contactor-reabsorber.

4. Fractionators.—The raw-feed product is pumped through a raw gasoline-finished gasoline exchanger into the stabilizer column. This fractionator is controlled to give a specification natural-gasoline product off the reboiler. The finished gasoline flows through the gasoline exchanger, through a gasoline cooler, on to storage. Overhead vapors off the tower are totally condensed with cooling water. Condensed overhead product is pumped through a feed-bottoms exchanger to a deethanizer column.

The deethanizer column is controlled to give a specification L.P.G. product off the reboiler. The finished L.P.G. product is partially cooled by exchange with the fractionator feed. Final cooling before storage is accomplished by water cooling. The overhead vapors from this tower are partially condensed with water to supply the required volume of reflux. Uncondensed vapors are vented to the base of the rich-oil contactor-reabsorber for rich-oil stripping. Unrecovered vapors enter the reabsorber residue gas stream.

Hot lean oil from the base of the still is circulated through the stabilizer and deethanizer reboiler tubes to supply the required heat input to these fractionators. Lean oil from these reboilers rejoins the main lean-oil stream before entering the oil-oil exchangers.

Auxiliary Facilities at Plant

In addition to basic process equipment described, auxiliary facilities required for a completely integrated operating plant are installed. The equipment includes:

Compressor station.—Wet gas from the gas-gathering system is compressed in two stages from 5-in. vacuum to 300 psig. by two 800-hp. Cooper-Bessemer compressors. Residue gas in excess of local fuel requirements is compressed in one stage to 1,000 psig. by one 440-hp. Cooper-Bessemer compressor for delivery to pipe-line sale.

Steam plant.—Steam requirements are supplied by two 100-hp. fire-tube boilers operating at 170 psig.

Exhaust steam from reciprocating process pumps is held at a back pressure for use in the still for stripping and the heating of boiler feed water.

Electric power.—Electric-power requirements for the plant are supplied by three 165 kva. generators belt-driven by two-cycle gas engines.

Cooling system.—Water for cooling is circulated from an induced-draft cooling tower to shell-and-tube heat exchangers used for condensing and cooling.

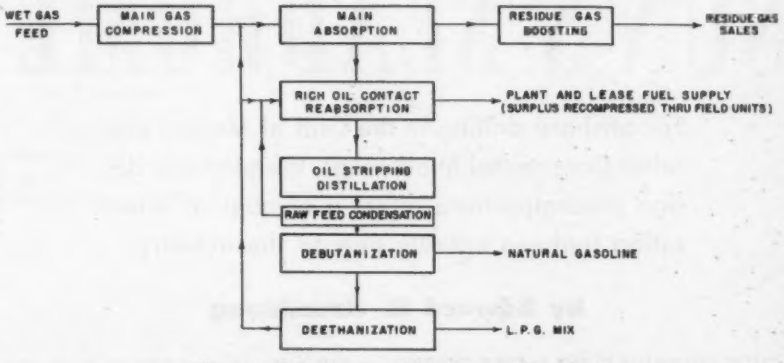
A separate closed cycle is used for engine and compressor jacket water cooling.

Storage and loading—Products storage provided is adequate for the storage of 5 days' design production, with separate storage for each of the products normally recovered. Storage is also provided for an emergency raw-water supply, engine jacket water, boiler feed water, absorption oil, and lubricating oil.

Loading facilities are available for truck or rail loading of all products.

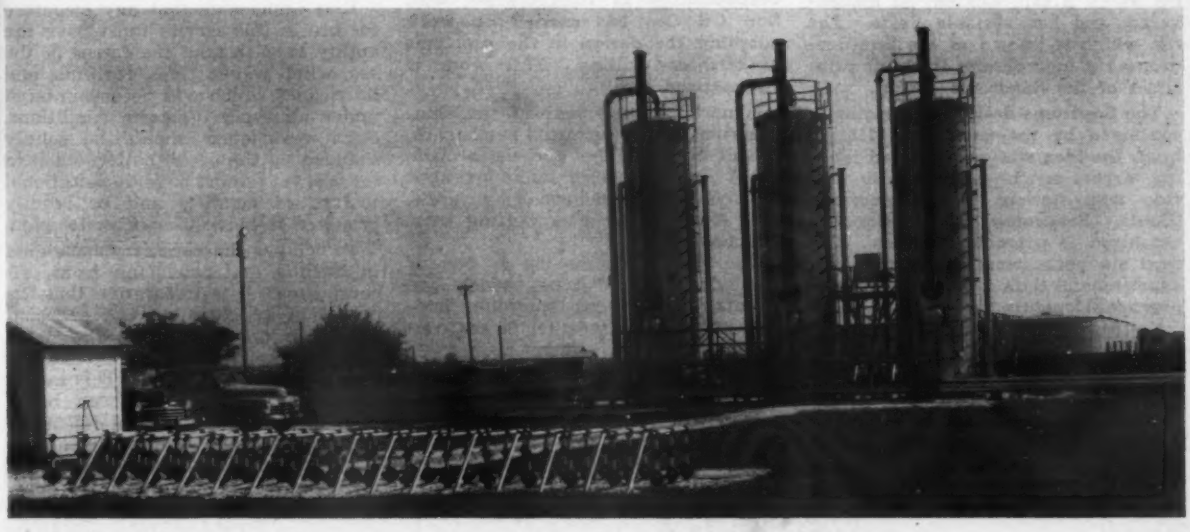
Water supply.—Fresh water makeup to the plant is supplied by water wells drilled near the plant site. Makeup water to the cooling system is chemically treated to minimize algae formation or delignification in the cooling tower as well as corrosion or scale formation in the cooling-water system. Water makeup to the boiler and engine jacket water systems is individually treated to counteract corrosion and scale formation tendencies.

The Mamou plant was constructed by Gasoline Plant Construction Co. Process design was handled by personnel of the Magnolia Petroleum Co. with mechanical design by personnel of the Magnolia and Gasoline Plant Construction Co.



Schematic flow diagram of Mamou gasoline plant.

Adjacent to plant is centralized field-separator installation and tank battery. Centralized manifold for the field wells is in left foreground.



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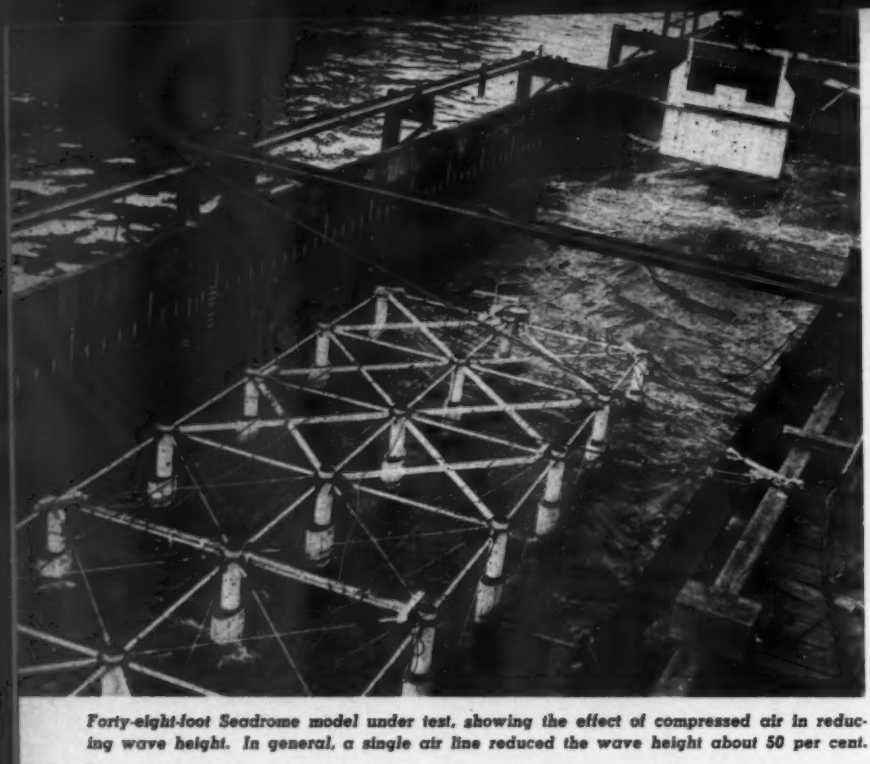


Forty-eight-foot Seadrome model under test, showing the effect of compressed air in reducing wave height. In general, a single air line reduced the wave height about 50 per cent.

SUN'S SEADROME

For offshore drilling in the Gulf of Mexico and other Continental Shelf areas, the platform design presented here offers a number of interesting features entirely new to the industry.

by Edward R. Armstrong

SUN SHIPBUILDING & DRY DOCK CO., in collaboration with Sun Oil Co., has designed a floating offshore rig which is self-docking, jet maneuvered, and has variable draft. The rig, which is known as the Sun-Seadrome rig, incorporates the basic principles of the Seadrome design.

The Seadrome design was originally conceived by the author in 1916. In brief, the idea was an anchored floating airport on the high seas to provide way stations for transoceanic flights. Seadrome Patents Co. was organized to promote the idea. The next six years were spent obtaining experimental data for the design of a practical structure.

In 1935 the Public Works Administration became interested, but pressure from Japan forced PWA to abandon the idea. Widespread publicity was given the Seadrome at that time. During World War II, the Air Transport Command asked the Corps of Engineers to conduct a detailed study of the project. As a result, extensive model tests were conducted at the plant of Sun Shipbuilding & Dry Dock Co. at Chester, Pa. Since 1946, Sun Shipbuilding, in collaboration with Sun Oil Co., has carried on work adapting the design to the problems of offshore drilling. This work is summarized here.

General arrangement of the Sun-Seadrome rig is illustrated in sketches. It will be noted that the rig is made up of eight buoyancy tanks arranged in two symmetrical rows of four units, each framed into a supporting truss structure.

The Sun-Seadrome rig is one of the self-contained type, which can maintain continuous operation irrespective of the weather or sea conditions.

The principal charactertistics are as follows:

Main deck—Length over-all 220 ft.
Main deck—Width over-all 134 ft.
Main deck—Normal height above sea level 28 ft.
Draft—(Light, 5,300 tons) 9 ft. 8 in.
Draft—(Loaded, 6,500 tons) 11 ft. 10 in.
Draft—On drilling duty, maximum 80 ft.
Power—Diesel electric—3,000 hp.
Jet propelled—3-4 knots.
Emergency storage of production 40,000 bbl.
Air-conditioned living quarters for personnel 40.
Self-docking for repairs and maintenance.

As presently designed the rig is to be used in ocean depths ranging from 12 to 80 ft. but readily can be modified to be effective at depths of 120 ft.

It is imperative that any structure for use in this service must have the ability to withstand the forces of the sea, wind, waves, tides, currents, and hurricanes which will be encountered under all types of storm conditions; Such a structure should be solidly founded on the ocean botton when in service, yet it must have the additional feature of mobility and be readily prepared to move to another location.

To achieve the necessary economics in drilling and producing from offshore areas, it is imperative that the operation be complete and self-contained in order to avoid the delay and expense incurred by division of effort and responsibility. This means that the rig should have on board all supplies and equipment for 10,000 to 16,000-ft. wells so that drilling operations can be continuous day and night for weeks at a time. No delay must ensue because of weather con-

The Author

Edward R. Armstrong has been interested in the oil industry since the turn of the century when he was developing drilling machinery for the Mellon interests in East Texas. However, he has spent relatively few years in the industry. Armstrong's career began in 1898 with 2 years of municipal engineering in Ohio followed by 2 years of railroad and levee building in Arkansas and East Louisiana. From this work he went to East Texas for the Mellon interests. In 1907 he went to St. Louis as a consulting automotive engineer. He joined the Du Pont interests at the start of World War I and was first chief of their mechanical experimental division by war's end. It was while he was with Du Pont that Armstrong conceived the seadrome idea—that of anchoring airfields in the ocean as way stations for airplanes. He left Du Pont in 1926 and organized Seadrome Patents Co. He has been devoting full time to the development of his idea since that time. For the past 4 years, Armstrong has been working on its application to offshore drilling in association with Sun Shipbuilding & Dry Dock Co.

ditions. This requirement is fully met in the Sun-Seadrome rig.

If a producing well is obtained, production may be stored safely by a water-displacement system in the foundation tanks for a period of approximately 90 days. By use of available pumping facilities provided, transfer of this stored production to barges at the rate of 1,000 tons per hour would be possible.

Foundation Stability

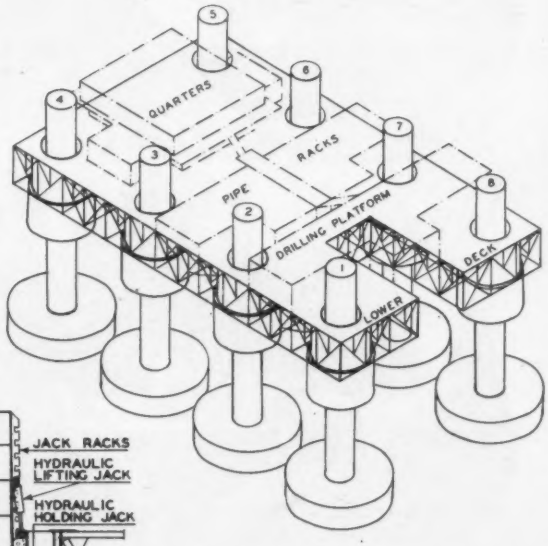
The load-bearing characteristics of any offshore location are largely determined by the character of the material making up the ocean bottom. Almost without exception, offshore areas considered as possible sources of petroleum are overlain with sedimentary deposits which vary widely in their foundation values.

As an example, offshore areas along the Louisiana coast are of recent sedimentary origin and are of considerable depth. The ocean bottom is covered with soft mud-like material of low foundation value. Along the Texas coast, however, the ocean bed is largely sand which in most instances makes a satisfactory foundation. This variation in foundation value in no obstacle to the use of the Sun-Seadrome rig because the weight of the structure carried by the foundation tanks can be that which may be safely supported by the ocean bottom of each particular location. This can be accomplished by varying the amount of water ballast carried in the foundation tanks, and by pumping out ballast, the load on the foundation tanks is reduced to that total which can safely be supported and so prevent structural settlement of the foundation.

With a large area such as that of a foundation-column tank resting on a soft ocean bottom, considerable force might be required to release it due to the so-called effect of suction. In the Sun-Seadrome rig design the bottom of the tank is made slightly tapering or cone-shaped and is divided into 45° segments by shallow vertical members on the outside of the tank bottom, into which fan-like nozzles direct a radial stream of water of about 5,000 g.p.m. into any segment. This will equalize pressure of the water on the tank bottom with that of the surrounding depths.

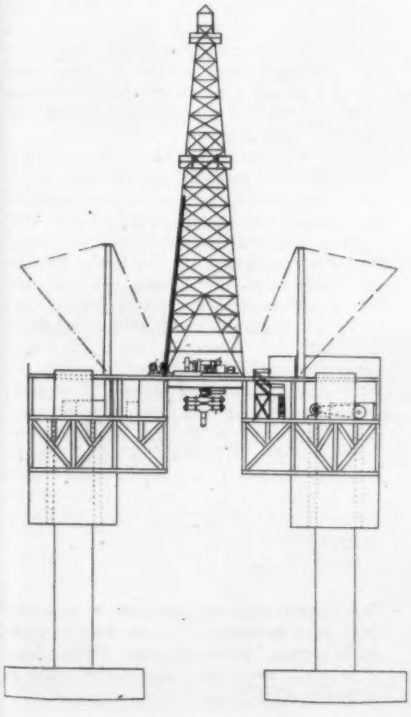
The jets can also be used to level off a foundation site, should it be necessary. A secondary use of the jets is to maneuver the rig over a well site or to move it to a new location.

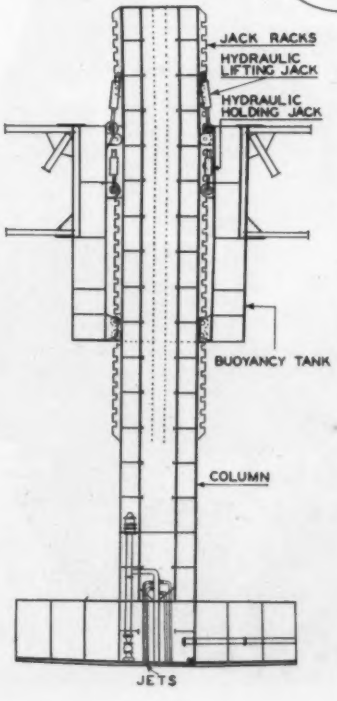
Sufficient power is available in jet form to propel the structure at a speed of from 3 to 4 knots. The rather large-volume pumping system available for jet operation is provided primarily for another purpose, that of dewatering the foundation-column tanks in a relatively short period so that the rig could be quickly brought from foundation condition to free floating, and if an emergency, such as a blowout or a fire, necessitated the rapid removal of the rig from over a well, it should be possible to accomplish the complete removal in approximately 15 minutes. Each column is equipped with a 5,000-g.p.m. pump operated by a 150-hp. electric motor.



Right: General outline of structure.

Below: Floating-type, variable-draft, self-docking, jet-maneuvered offshore drilling rig (Sun Shipbuilding & Dry Dock Co.-Sun Oil Co.). Drawings of front elevation, and section through column and buoyancy tank at 180°.





The hydraulic jack system that connects the deck structure with the foundation columns, raising or lowering the deck as the depth of the ocean necessitates, operates at a pressure of from 4,000 to 7,500 psi. and a piston speed of from 6 to 12 in. per minute. The lifting operation on each column requires four lifting jacks and four holding jacks (all jacks are double-acting). The jacks can be operated manually or automatically, all columns together or individually, as circumstances require.

In ocean depths up to and including 32 ft. the telescoping feature of the rig is not used except for final leveling up of the main deck and for equalizing the spud bottom loading which might otherwise vary somewhat should a local "soft spot" be encountered under a spud unit at the well site selected.

(Continued on page 291)

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PIPE LINING
On the Gulf Coast

by Paul Reed
Pipe Line Editor

CONTRIBUTIONS of the Gulf Coast to pipe-line practices include the solution of problems characteristics of the region as well as advancements which promise to have widespread application in the industry.

Construction this spring of 33 miles of 20-in. for Texas Eastern Transmission Corp., contracted by Associated Pipe Line Contractors, Inc., between Hankamer and Beaumont, Tex., exemplifies current methods in Gulf Coast swamp country.

In crossing several swamps along the route—the longest being 11,000 ft. —pipe was floated by the current effective method with the ditch filled with water to a depth of approximately 2 ft. Coated and wrapped joints were delivered to the job from a yard temporarily located in a nearby town. The yard was operated by Crutcher-Rolfs-Cummings. After each joint was welded to the section already floating in the water, work was done for coating and wrapping to cover the bare space near the weld. Then the section moved 40 ft. by tractors at each end to a position ready for addition of the next joint. In this way the floating pipe was moved along the ditch at the rate of approximately 1,000 ft. per day.

The expense of providing temporary bridges for mobile equipment over drainage canals and at other obstacle crossings, has been reduced at this project by utilizing portable steel bridges furnished by Portable Bridge & Equipment Co. These bridges are of steel-treadway type with two parallel channel beams tied togther laterally by I-beams, channels, and pipe sleeves. Connection is made by inserting connecting pins. The principle resembles that of toy erector sets. The structures are 100 per cent recoverable. They can be more quickly erected at lower cost than the temporary wooden bridges which have been customary for swamp operations.

Such bridges are capable of sus-

Top: Coated and wrapped joint is delivered from yard operations. Center: Joint is lined up to section floating in ditch. Bottom: Joint is welded, then bare area near weld is coated.

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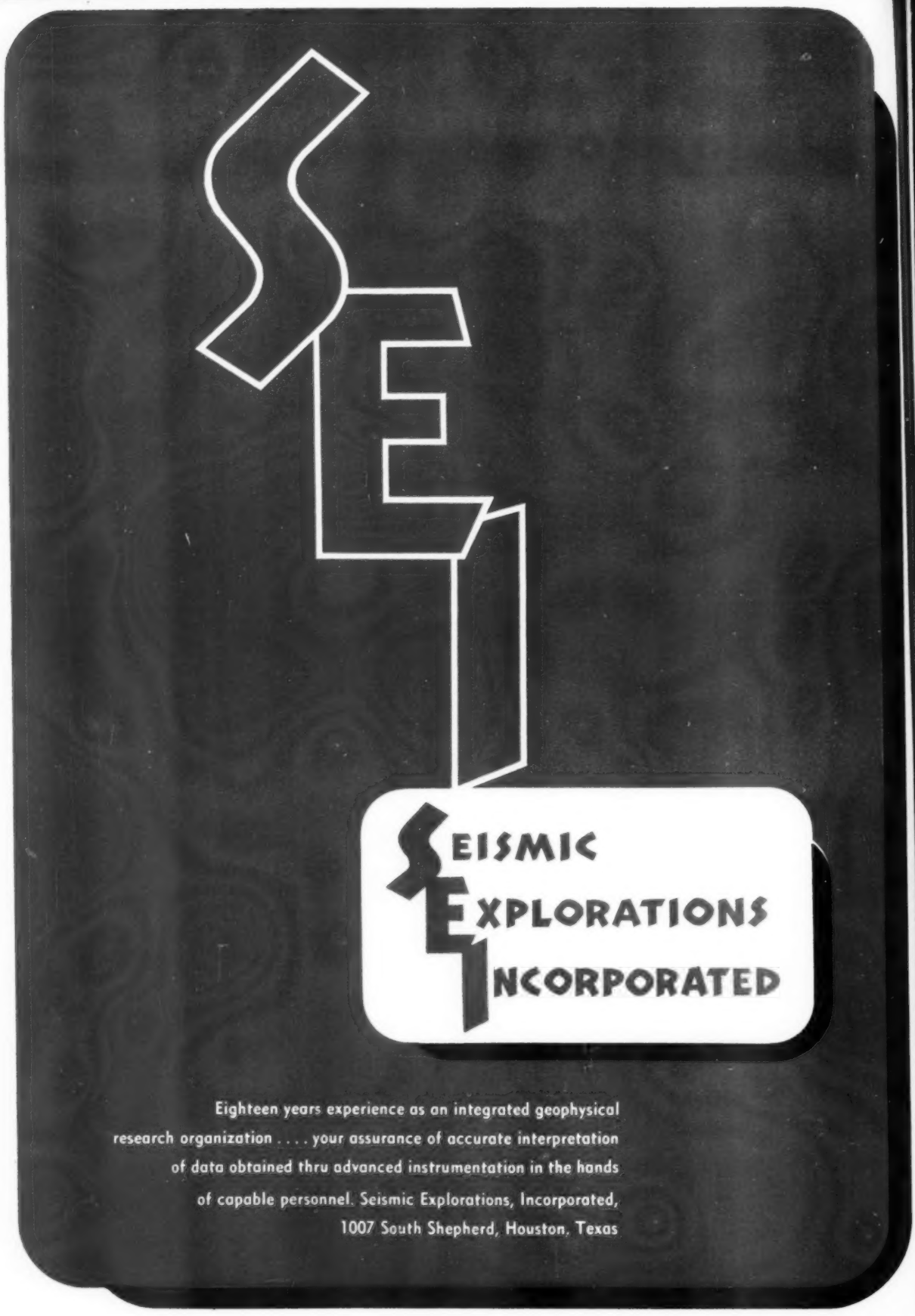

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taining loads normally transported for pipe line construction. Bridges of this type were developed and extensively used for military operations in World War II.

Yard coating and wrapping of pipe is being widely used on the Gulf Coast because of the advantages of eliminating the use of heavy traveling-type priming and doping equipment operations in swamp territory.

To overcome buoyancy, river clamps and anchors have been used in some sections for Gulf Coast projects. Concrete-encased coated pipe is being installed in certain swampy locations for Gulf Coast lines this year.

Large-scale double-jointing with automatic submerged-arc welding has been developed within the past year in Gulf Coast operations of Fish Constructors, Inc., for the laying of 30-in. pipe for the Transcontinental Gas Pipe Line Corp. system being built from Mercedes, Tex., to New York City. The pipe originally is delivered in 30-ft. joints.

Some of the difficulties previously encountered elsewhere were overcome by the method adopted by Fish by which a stringer bead is applied manually with the pipe in a stationary position as the first step in welding.

For the automatic operations to complete the weld, the pipe is rotated. Subsequent to pioneering work with this type of welding, the practice of double jointing by the automatic submerged-arc method is being widely used on other major pipe-line projects.

The possibilities of steam-turbine drive for centrifugal compressors for natural-gas transmission will be exploited for the first time at a Transcontinental station to be built this year near Eunice, La. This type of compressor driving unit appears to be attractive in areas of abundant water supplies and low-cost natural gas. For the Eunice station Ingersoll-Rand will build two 5,000-hp. "packaged" units each with steam turbine and compressor mounted on a condenser.

The station will use 60,000 lb. of steam for transmitting 400,000 cu. ft. of gas daily at 525 to 800 psi., requiring 8,000 hp. in two units. Design conditions would call for 9,600 hp. for reciprocating compressor units for equivalent transmission service.

The first three major pipe-line radio-communication systems have been planned for construction this year for systems traversing the Gulf Coast areas.

These microwave installations will include Humble Pipe Line Co.'s 400-mile, Mid-Valley Pipe Line Co.'s 900-mile, and Transcontinental's 1,800-mile systems.

Tractor moving 1,100-ft. floating section in water-filled ditch. (Associated Pipe Line Contractors, Inc.)

Crossing canal via portable steel bridge near Fannett, Tex.

Pipe loading at coating and wrapping yard (Crutcher-Rolfs-Cummings) at Winnie, Tex.

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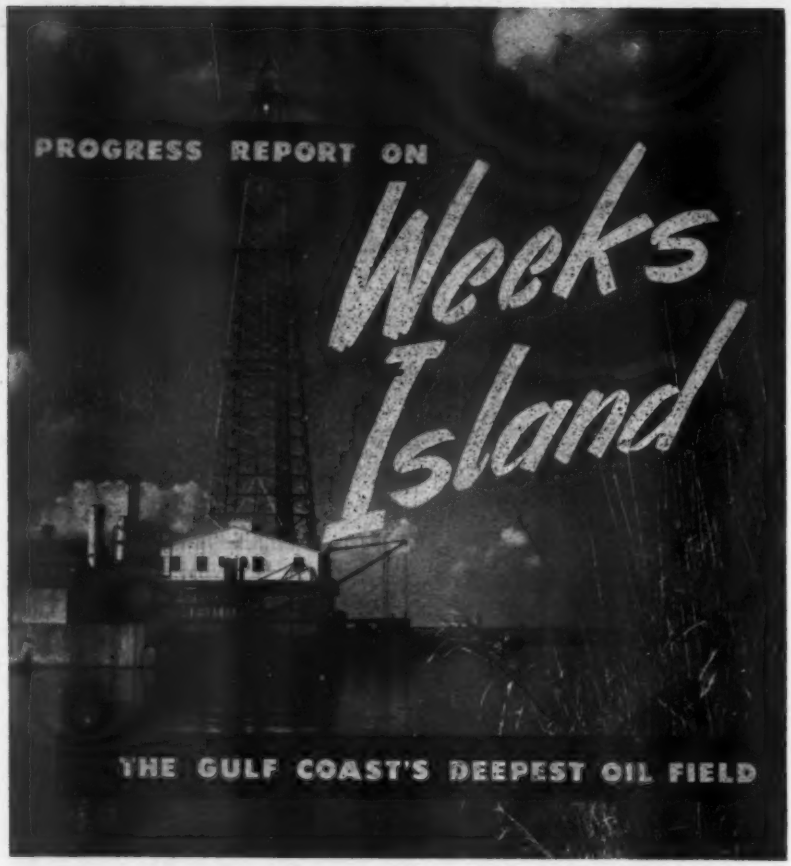


This barge-mounted steam rig is being used by Shell Oil Co. to develop Weeks Island field where the deepest well in the Gulf Coast area for 1949 was drilled. The record-breaking test was the 1 Weeks-Gal 1 State Unit 1 which penetrated to 15,913 ft. before being completed as an oiler at 14,150 ft.

by E. G. Christianson

Sixty-eight wells have been drilled in Weeks Island field since its discovery 5 years ago. Shell Oil Co. has been the major operator in the field, accounting for 44 of these wells. Deep-drilling practices have been pioneered at Weeks Island. Most of the earlier wells required an average of 150 to 200 drilling days. By contrast, seven of the eight most recent deep wells have been completed in less than 100 operating days.

Edward G. Christianson is division exploitation engineer for Shell Oil Co. in Franklin division, of which Weeks Island field is part. He is a graduate of University of Wisconsin in 1937 with a B.S. in mining engineering. He joined Shell in March 1938 in Houston and has worked in practically all of Shell's operations throughout South Louisiana.

FIVE years have elapsed since the successful completion of Shell-Smith State Unit 1 Well No. 1 established initial production in Weeks Island field in Iberia Parish, Louisiana. This well, which was completed as a flowing producer through gun perforations from 13,505 to 13,520 ft., has proved to be one of the most important discoveries along the Louisiana Gulf Coast. Development of the field is now being effected by three companies, Shell Oil Co., Humble Oil & Refining Co., and Gulf Refining Co.

The Weeks Island structure is a shallow piercement-type salt dome located approximately 15 miles south of New Iberia, La., and is a member of the "Five Island" chain, which includes Jefferson, Avery, Weeks, Cote Blanche, and Belle Isle islands. All are piercement-type domes and lie in a straight line bearing from northwest to southeast.

The Five Islands have been known as the most prominent elevations in Coastal Louisiana, and the surface of Weeks Island reaches a maximum elevation of some 135 ft. above the surrounding terrain. The salt stock has intruded to within 60 ft. of the surface and commercial mining of salt has been conducted at Weeks Island since about 1900.

The island proper is nearly circular, and is approximately 2 miles in diameter. Both marine-type and land rigs have been used in the Weeks Island development campaign, depending upon the position and terrain of the selected location.

In the past 5 years a total of 68 wells have been drilled, or are being drilled, by all operators in the field. Of this number 45 wells have been completed as producing wells, 14 as dry holes, and 9 are being drilled at the time of this writing.

Shell has completed 34 producing wells, 4 dry holes, and is currently drilling 6 additional wells.

Humble has completed 10 producing wells, 10 dry holes, and is currently drilling 2 wells.

Gulf Refining Co., operators for a Gulf-Shell joint account, has completed one producing well and is currently drilling a second well.

The total field allowable assigned by the minerals divison of the Louisiana State Department of Conservation during April amounted to 11,335 bbl. per day, and was apportioned among the various operators as follows: Shell, 9,278 bbl.; Gulf, 338 bbl., and Humble, 1,279 bbl.

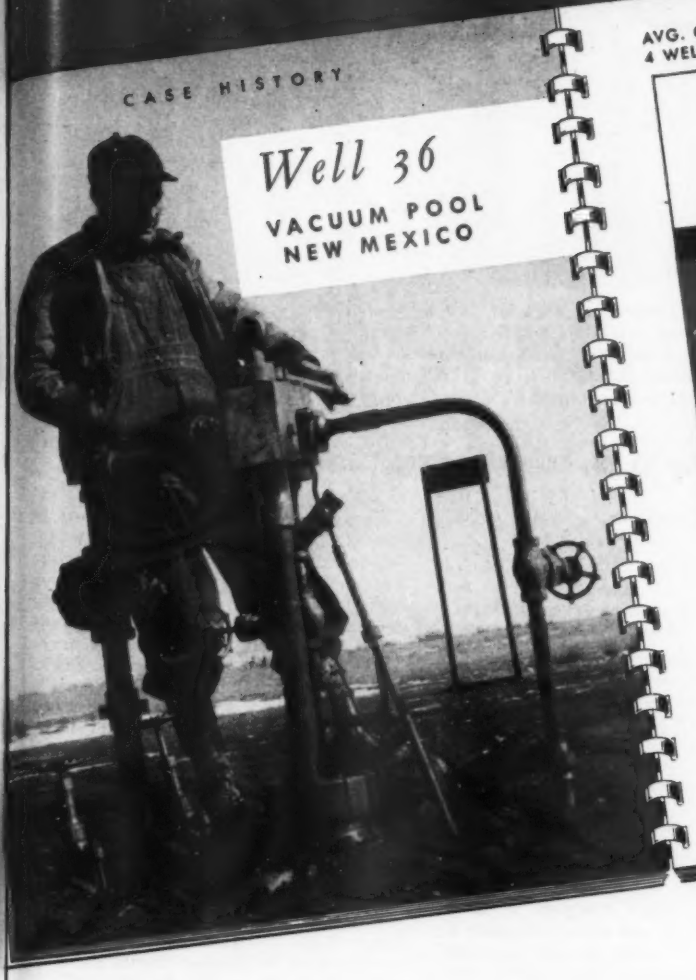
Very Marshy Terrain

The majority of the drilling requires the use of barge-mounted rigs, because of the marshy terrain. The demands of the deeper drilling caused Shell to renovate its rigs assigned to Weeks Island, providing larger and more modern equipment with adequate power and pump capacity. A special rig was designed and built for use at Weeks Island. This steam rig was the subject of an article presented in The Oil and Gas Journal of March 11, 1948, and is one of the largest and most powerful drilling assemblies to be mounted on a barge. The use of the heavier equipment has been instrumental in reducing well time and costs and has tended to minimize mechanical failures which would cause delays.

Shell's casing program on the north flank was altered after trouble on the earlier wells, and longer strings of surface pipe are now used. Originally 2,500 ft. of 10¾-in. surface casing was cemented in a 15-in. hole, and a 9⅞-in. hole drilled for a 7-in. or 7⅝-in. protective string. The objective zone was penetrated in a reduced hole and 5-in. liner installed for completion. This program has been abandoned and 10¾-in. casing is now cemented at 4,500 ft. A 9⅞-in. hole is then drilled to total depth. This program offers

(Continued on page 298)

Free Pumping
REDUCES PULLING COSTS *98.5%*
ON NEW MEXICO LEASE



CASE HISTORY

Comparative Operating Costs

The Vacuum Pool, New Mexico, offers another vivid example of the substantial savings in operating costs made possible by Free Pumping.

Over a 17-months' period the operator kept a detailed report of expenses incurred in pumping five wells on the same lease, operated under practically identical conditions. Four wells were conventionally pumped, and one Free Pumped.

For comparative purposes two sets of cost figures are shown: One for the Free Pumped well, and one for an average of the four conventionally pumped wells. In pulling alone, Free Pumping saved as much as 98.5% compared to the average of the four wells. The savings in the other categories, as shown in the table below and accompanying bar chart, were also impressive.

OPERATING COST DATA

	Avg. Cost of 4 Conventionally Pumped Wells	Well 36 Free Pumped
Period Covered	17 mos.	17 mos.
Pulling Costs (Labor Only)	$ 655.81*	$10.00
Total Paraffin Removal Costs	82.39	13.60
Total Pump Repair Costs	456.19	71.08
TOTAL OPERATING COSTS	$1194.39	$94.68

*Even when compared with the best of the 4 wells, the pulling cost of Well No. 36 was 96% lower.

Operators looking for ways to substantially lower pumping operating cost are turning to Free Pumping.

Because one man alone can surface, change, and run the bottomhole pump, Free Pumping virtually eliminates pump pulling expense and downtime losses.

As shown by the figures above, paraffin control, another big expense in many fields, is reduced to a negligible, low-cost item by Free Pumping.

There are other important advantages of Free Pumping. For every production problem that arises, the Free Pump operator is able to qualify the source and scope of his problem quickly, easily, and at a minimum of expense.

Enjoy flexibility in your producing operations that you have never before experienced by switching now to Free Pumping.

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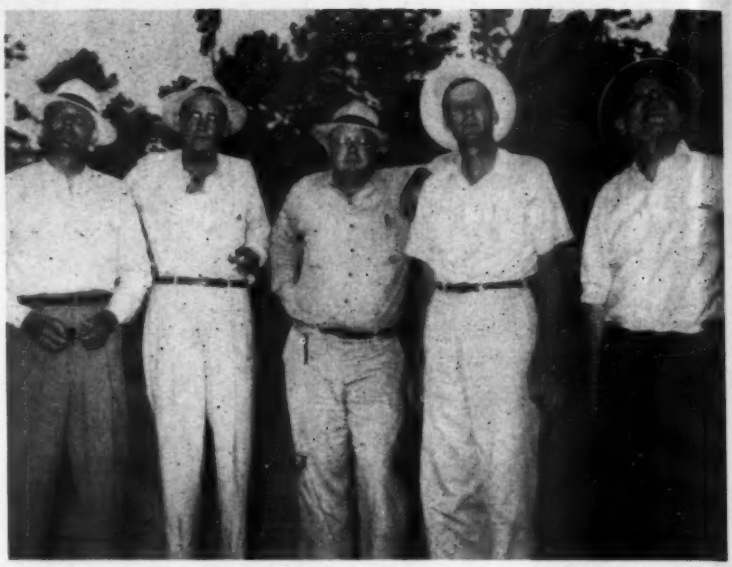
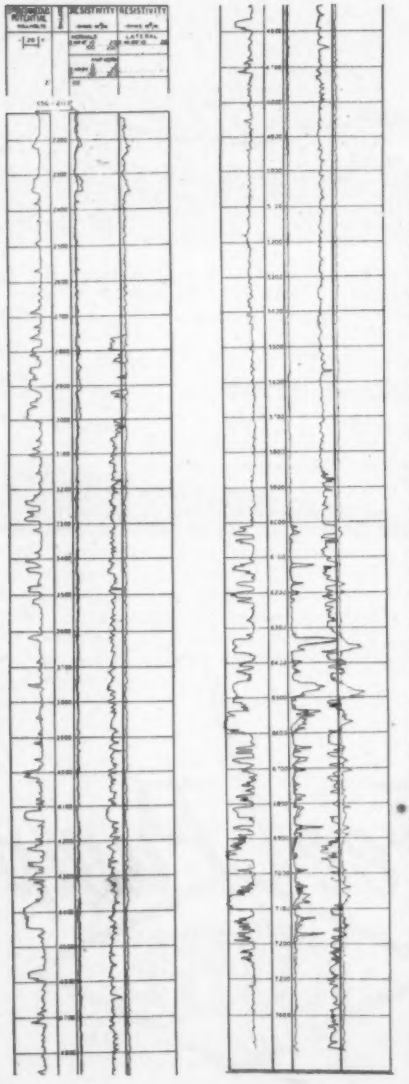
EAST VILLAGE MILLS FIELD CURRENTLY A GULF COAST HOT SPOT



Interested spectators while the East Village Mills discovery was coming in included the following Houston Oil Co. supervisors: E. K. Bissett, Beeville district superintendent; Elzie Allen, drilling superintendent; J. B. Davis, drilling superintendent for East Village Mills district; C. R. Tucker, production superintendent for East Village Mills district; and W. B. Duncan, manager of drilling and production.

Electric log of discovery well of East Village Mills field.



by O. S. Hervey and Barrett E. Booth

DISCOVERED only a year ago, East Village Mills field of Hardin County is one of the "hot spots" of the Texas Gulf Coast. The field now has 48 oilers, has produced over 300,000 bbl. of oil, and development is continuing at a fast pace.

The field is noteworthy for the detailed reservoir information which the operators are gathering. Extensive coring and drill-stem testing has been carried on during the development period. In addition, reservoir-fluid analyses are being made, material-balance calculations set up, reservoir-performance curves drawn, bottom-hole-pressure surveys taken every 4 months, and production tests run monthly or more frequently on all wells. Thus, a complete engineering study can be made as soon as sufficient performance data have been accumulated.

The discovery well for East Village Mills field, the Houston Oil Co.-American Republics Corp. 1 Nona Fletcher, was completed June 9, 1949. On a 24-hour potential test, the well made 255.4 bbl. of oil on a 10/64-in. choke through perforations from 7,058-66 ft. Casing pressure was 1,160 psi. and tubing pressure 1,100 psi. The corrected gravity of the oil was 41.2° and the gas-oil ratio 634 to 1. Original bottom-hole pressure in the discovery well at a datum of —6,967 ft. was 3,160 psig. The 1 Nona Fletcher was drilled on a seismic prospect on a 4,176-acre lease which Houston Oil and American Republics had from Nona Fletcher Mineral Corp.

As there was Yegua production in Village Mills field just northwest of this area, a coring program was set up to core the first Cockfield-Yegua sand. The coring and a drill-stem test showed oil in the 1 Fletcher. The open-hole drill-stem test was made from 5,955-59 ft. The well was wire-line cored next in the second Cockfield sand and a gas-distillate drill-stem test was made just below 6,000 ft. Most of the production in Village Mills field was from the first 2 or 3 Cockfield-Yegua sands. However, there had been a show of oil in one of the deeper sands in the older field. Hence, it was decided to drill on down into the Yegua section in the wildcat and core. This proved to be a wise decision as two subsequent oil sands were discovered. A sand just below 7,000 ft. had a 60-ft. oil column when cored. A deeper Yegua sand at 7,216 ft. found a thin oil column.

Electric Log Run

An electric log was run in the discovery well, but it was not practicable to take side-wall cores, as the hole had been sidetracked. Wire-line coring and a drill-stem test had already revealed two good oil sands. The electric log showed that nearly every sand throughout the entire 1,300-ft. Yegua section appeared to have an accumulation of either oil or gas. It is difficult to distinguish between the two on the electric log, so it was not until the second well was drilled that the individual sands could be tested to determine which had oil and which had gas.

The fact that every sand through-

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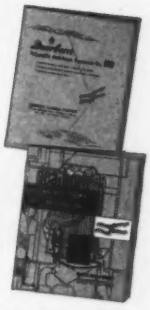

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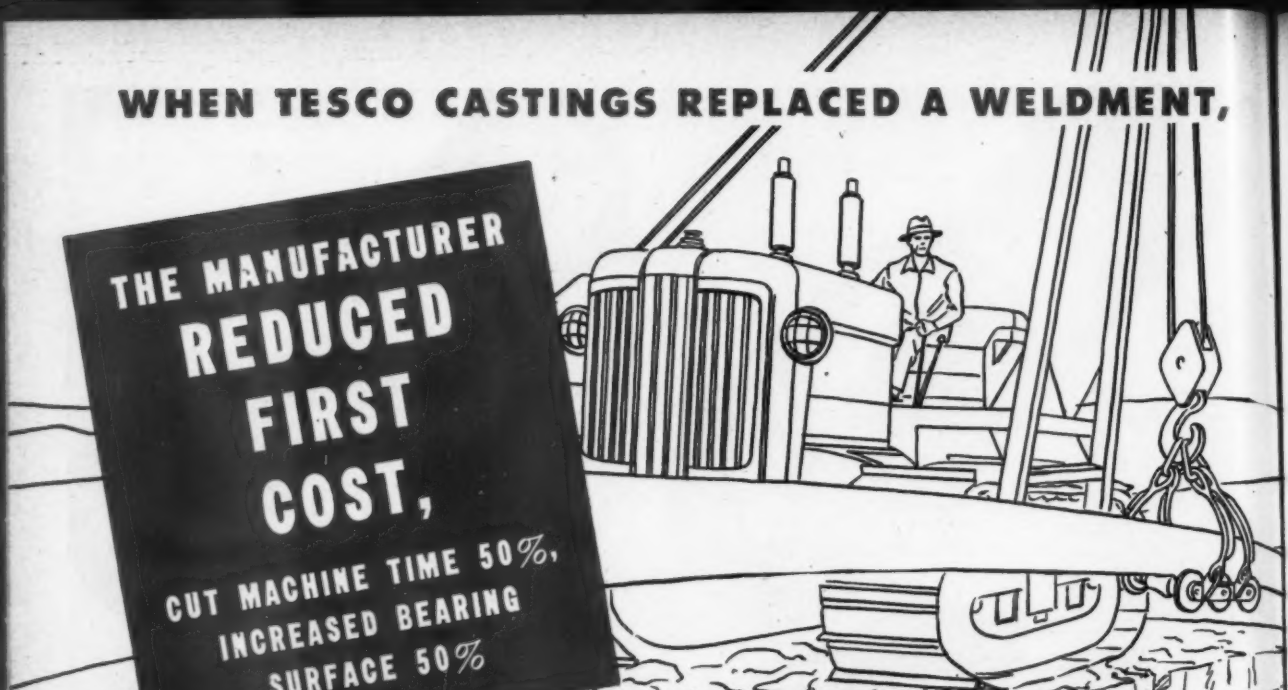

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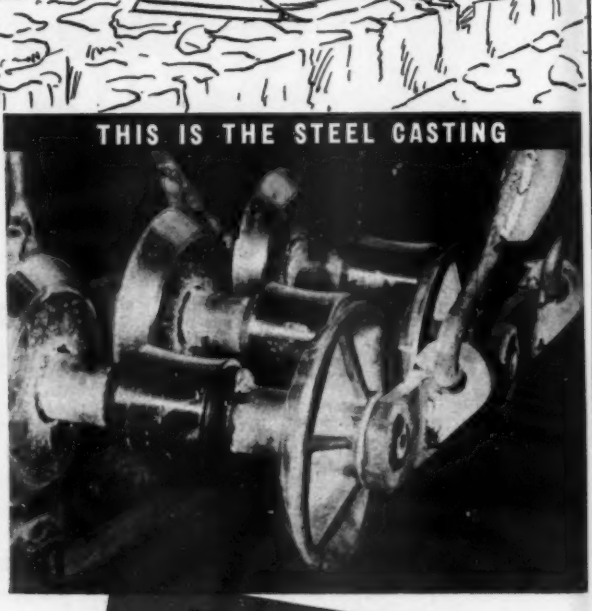

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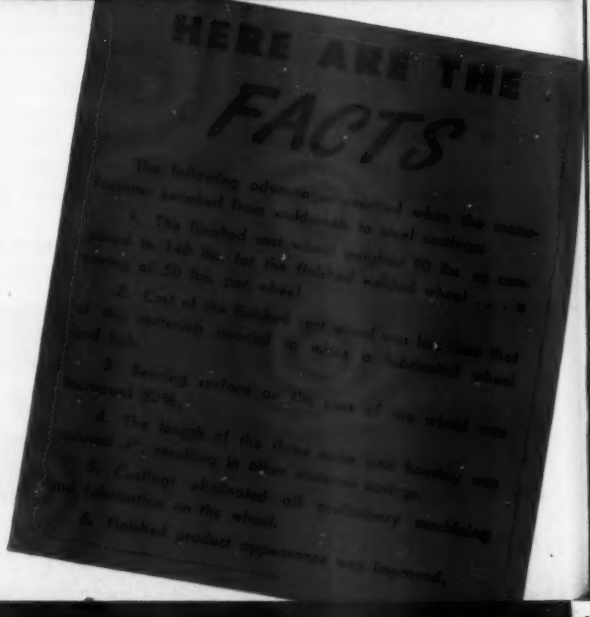

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GOOD CASTINGS — TESCO — CARBON AND ALLOY STEEL — HOUSTON, TEXAS

The Authors

O. S. HERVEY

B. E. BOOTH

O. S. Hervey, production geologist, Houston Oil Co. of Texas, received his B.S. degree in Geology from Drury College in 1932. He was in business for himself until 1936 when he joined Sun Oil Co. as a geologist. He was with Sun until 1947 and spent his last 5 years with the company in its San Antonio district office. In 1947, he became associated with Union Oil Co. of California as a geologist in the firm's Houston office. Hervey assumed his present job in December 1948.

Barrett E. Booth, petroleum engineer for Houston Oil, graduated in petroleum engineering from Louisiana State University in 1940. Prior to army service in World War II, he was employed by Shell Oil Co. as an engineer trainee. He served 4½ years in the Army with overseas service in the Southwest Pacific and was discharged a captain. Booth joined Houston Oil immediately following his army discharge. He served as Beeville, Tex., district engineer for 3 years before coming to the home office in Houston.

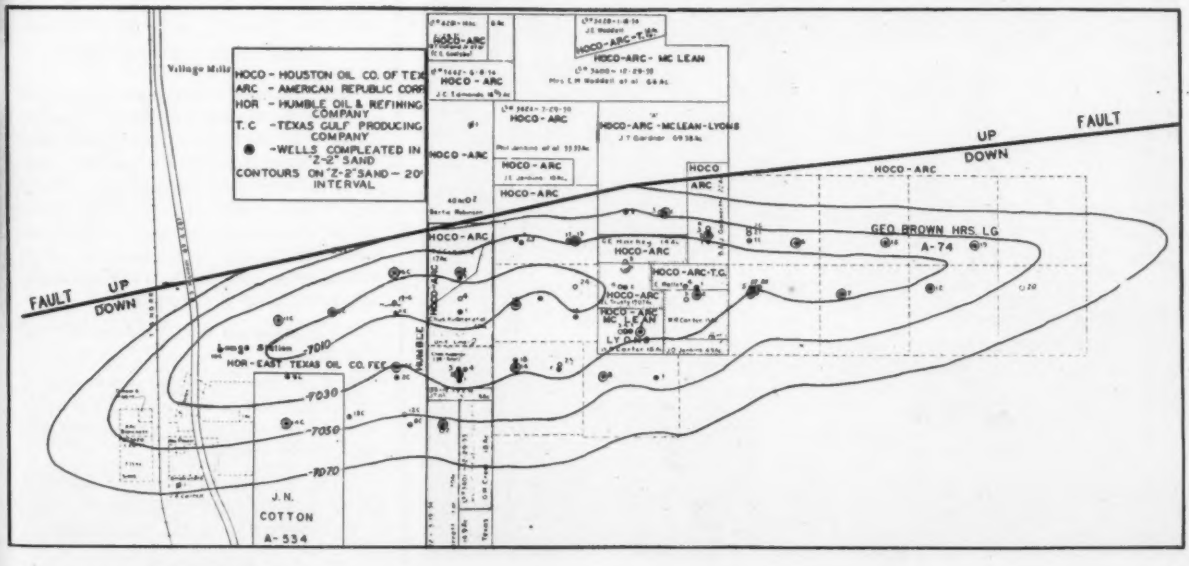
Left: Crew members set the christmas tree on the discovery well of East Village Mills field under the supervision of J. B. Davis, Houston Oil's district drilling superintendent. Right: Floormen run tubing during the completion of the 1 Nona Fletcher on June 9, 1949. On a 24-hour potential test, the well made 255.4 bbl. of oil on a 10/64-in. choke through perforations from 7,058-66 ft.

out the Cockfield-Yegua section in this field appears to contain either oil or gas is very unusual. The several reservoirs vary from gas sands unassociated with oil through gas sands with thin oil columns to oil sands with no gas cap. The maximum oil column in any one reservoir is 72 ft.

Because the 7,000-ft. sand had been thoroughly wire-line cored and drill-stem tested, the discovery well was completed in this sand—the "Z" sand. The wells drilled immediately after the discovery were also completed in this sand, although a lower oil sand was found in the second hole. Ordinarily, the procedure would be to complete in the lowest horizon and work up, but as the "Z" sand was the deepest horizon on which full information was available, this was not done. No completion was made in the deeper oil horizon until the sixth

(Continued on page 312)

Sand-completion map of East Village Mills field.



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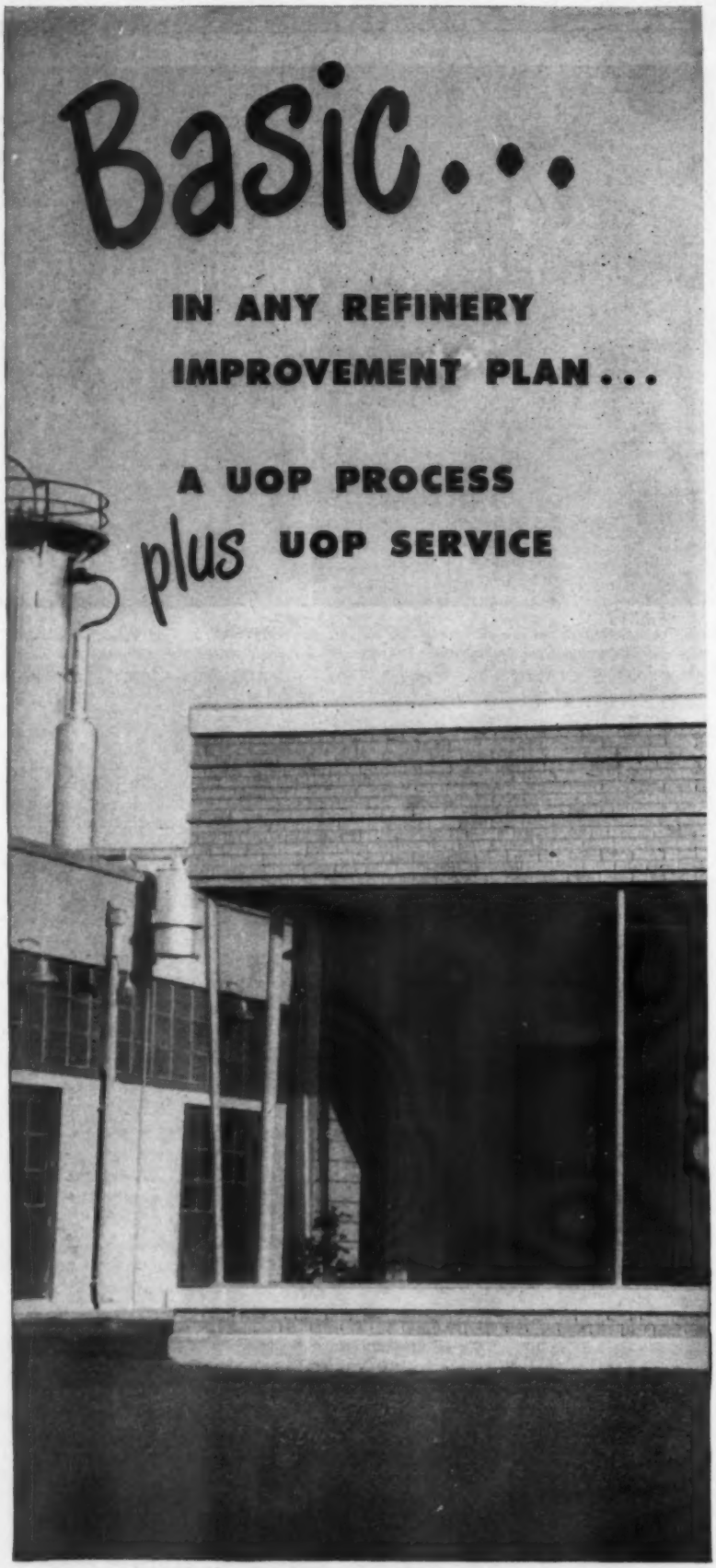
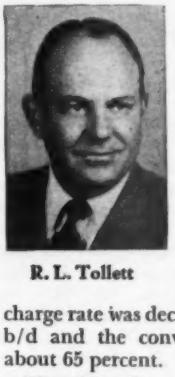


New Cosden Cat Cracker Runs West Texas Gas Oil

By R. L. Tollett
President,
Cosden Petroleum Corporation

THE FIRST fluid catalytic cracking unit ever built to operate exclusively on gas oil from West Texas crudes went on stream at our Big Spring, Texas, refinery in November of last year and is now producing 2,600 to 2,800 b/d of gasoline.


R. L. Tollett

The unit was originally designed on the basis of a 6,000 b/d charge rate and a 50 percent conversion to produce 2,460 b/d of gasoline. In actual operation, however, the charge rate was decreased to about 4,200 b/d and the conversion increased to about 65 percent.

The following table, covering a recent week's run, shows the actual yield of the various products compared with the design figures:

	Design	Actual	Actual Vol. %
Raw oil charged	6000	5187	100
Gasoline	2160	2627	50.7
Light cycle stock	1950	1427	27.5
Heavy cycle stock	1050	249	4.8
Slurry oil		123	2.4
Conversion %	50	65.3	

During a typical 24-hour run, the results were as follows:

	Barrels s/d	Vol. %
Raw oil charged	5170	100
Gasoline (10.5 R v.p.)	2810	54.5
Light cycle stock	1450	28.1
Heavy cycle stock	280	5.45
Slurry oil	200	3.85

Modernization Program

The new cat cracker is the heart of an improvement program planned late in 1948. Our objective was to modernize our facilities to produce a gasoline that would meet the requirements of the high compression engines of today and of the future. Consultation with Universal Oil Products enabled us to set up a four point program of modernization which included these steps:

1) Installation of a vacuum distillation unit.

2) Installation of a gas concentration unit consisting of a new gas absorption system and adaptation of existing stabilizer to new service.

3) Revamping and enlarging of the existing catalytic polymerization unit.

4) Installation of the cat cracker.

(Advertisement)

The first three steps were necessary to supply feed to the projected cat cracker, designed to crack 6,000 b/d, and to handle its products. Design and engineering of the entire program was entrusted to Universal Oil Products Company and the cat cracker is built to UOP's improved fluid design.

Run 17,500 b/d

The refinery is presently running about 17,500 b/d of crude from the Howard-Glasscock, East Howard and Benedum fields.

Because of the average high sulfur content of these crudes, the vacuum tower is completely alloy-lined and the furnace tubes are chrome alloy. It was designed to handle 7,300 barrels of reduced crude of 22° API gravity and existing equipment was used as far as possible in the new construction.

Reduced crude is taken directly from the crude still and pumped through the vacuum unit heater into the vacuum unit fractionating column. About 5,400 barrels of 28° API gravity vacuum gas oil are taken overhead from the tower while about 2,200 barrels of asphalt are withdrawn from the bottom of the tower. This asphalt is blown and blended for the manufacture of specification road oils and asphalts, roofing asphalts and commercial asphalt fluxes of various types.

The gas concentration system consists of low and intermediate pressure receivers, compressors, absorbers, stabilizer and deethanizer.

Gases from the cat cracker are compressed in two stages to about 200 pounds pressure per square inch. They pass through the primary absorber where they are contacted with O.H. receiver liquid, and then into the sponge absorber. Sponge oil is light cycle stock which is returned to the main fractionator for stripping. Primary absorber bottoms go to the stabilizer. Overhead from the stabilizer joins with a similar stream from the thermal cracking debutanizer and the mixture passes into the deethanizer, which was designed to remove the major part of the H_2S as well as the ethane from the C_3 and C_4 hydrocarbons which are withdrawn from the bottom of the deethanizer as feed for the poly unit. Up to 90 percent of the H_2S is removed from this stream by the deethanizer. Deethanizer bottoms contain 150 to 160 gr. H_2S per 100 SCF.

The C_3 and C_4 fractions pass through a caustic and a water wash on their way to the poly unit. The caustic treatment removes the remaining H_2S and the water takes out the nitrogen compounds.

The poly unit is daily processing approximately 1,100 barrels of feed, yielding about 410 barrels of polymer gasoline having a Research octane number of 97 clear.

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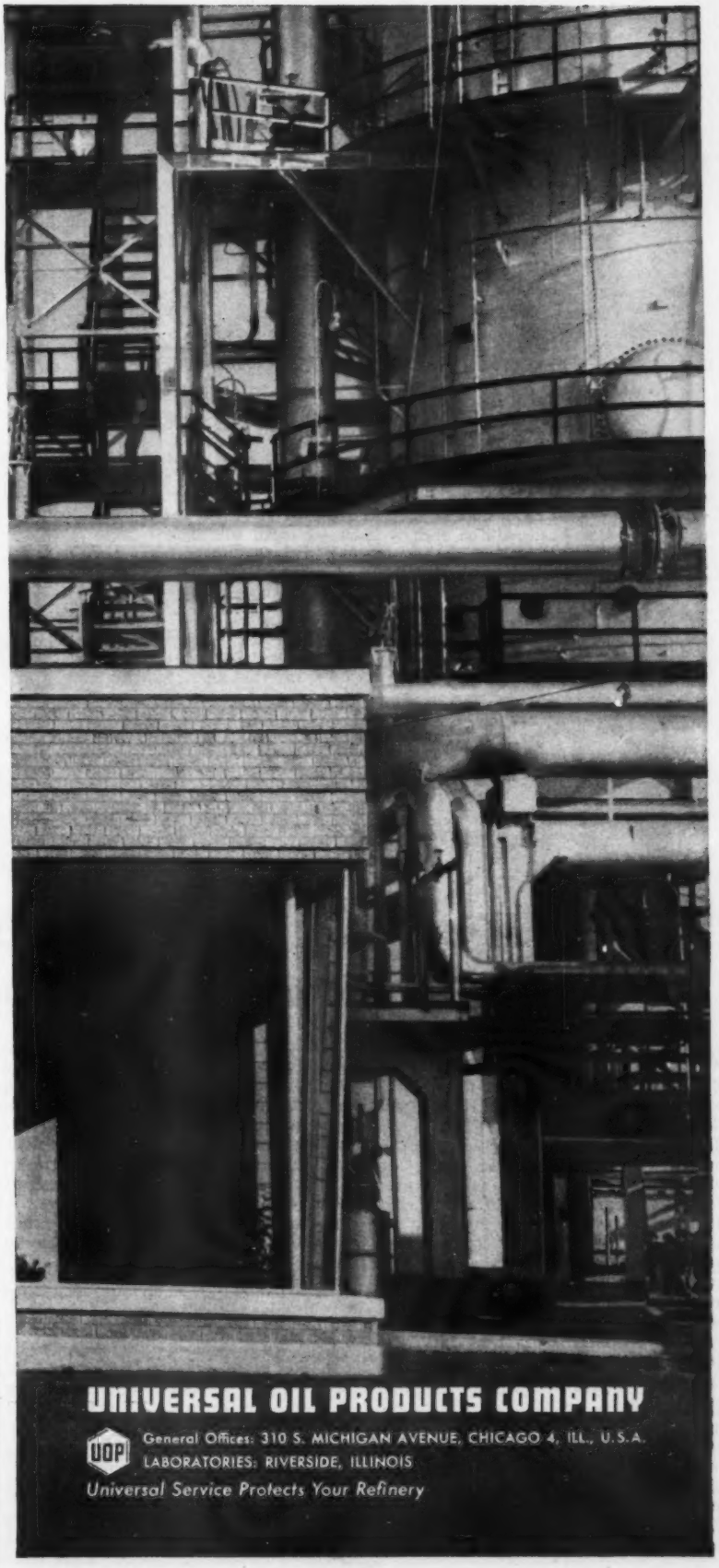
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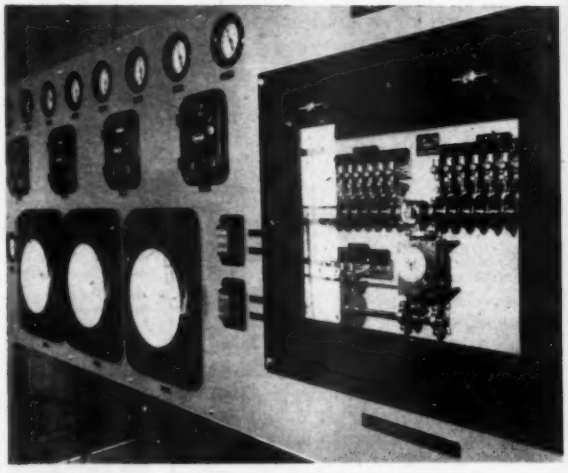
Fig. 1—The equipment in this picture handles all phases of a 20-well pressure-maintenance project in South Esperson Dome field of Liberty County, Texas. Controls at the central location even turn the producing wells on and off.

Fig. 2—(Right) Most unusual item on the control panel at South Esperson Dome is the electrically driven intermitting device, at right, which controls the producing time of the wells. It has a small cam for each well, which revolves at the rate of one revolution per 24 hours. The pumper can install segments on each of these cams that will allow any desired flow rate on individual wells.



CENTROL CONTROL *of a Gulf Coast* Pressure-Maintenance Project

by C. K. Brown and W. D. Mason, Jr.

ALL phases of a pressure-maintenance project are being controlled from a single central point by General Crude Oil Co. in a Gulf Coast field. It is not even necessary for the field man to visit wells (except for maintenance and well servicing) in this unique operation which is almost fully automatic. Controls at the central location turn producing wells on and off, separate the oil and gas, remove the liquids from the gas, regulate the compressors for the injection program, supply the injection wells with gas, and turn makeup gas into the system, when necessary.

This unique installation has just been installed in South Esperson Dome field of Liberty County, Texas, midway between Houston and Beaumont. The pressure-maintenance operation is being conducted in a particular fault segment in the Crockett formation between 6,300 and 7,830 ft. General Crude is the only working-interest owner. Royalty interests have been unitized. Twenty oil wells are being produced in the unit and one well is being used for gas injection, at present. Daily oil production is approximately 1,500 bbl. Approximately 4,000 M.c.f. of gas daily is being injected to maintain pressure in the gas cap of the reservoir. Casing-head gas is being obtained from the unitized area and, when needed, from other wells in the Esperson Dome area.

The primary reason for installing the highly centralized and nearly automatic setup at South Esperson Dome was to provide a flexible method of conducting the pressure-maintenance project. The volume of fluid and gas produced from each well can be controlled closely for the best reservoir performance. This flexibility is further insured by a Texas Railroad Commission order which permits the wells to be produced on a net gas-oil-ratio basis.

In addition to flexibility, the project is attractive from an economics standpoint. The field is located in low terrain and rains frequently make it impossible for pumpers and well-service employes to get to the wells. With a central control point it is unnecessary for the pumper to visit the wells during wet periods.

The limits of production in the fault segment covered by the project have been established. Hence, no further drilling is contemplated and the present installation will suffice until the reservoir is depleted. It is anticipated that the pressure-maintenance program will require 15-20 years, further enhancing the economics of an efficient and effective installation.

The most interesting feature of General Crude's operation is the central manifold from which the 20 producing wells are controlled. (See Fig. 1.) The controls and meters in use are of a new type for the oil country. Coming from the producing wells, the

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PELTON
Model 512-9-30C-P
Pump Bore: 1½"
Pump Setting: 11,140 ft.
Surface Stroke: 30 ft.
Production: 300 B/D
Previous Equipment: Gas Lift

CASE No. 2
PELTON
Model 412-9-20A
Pump Bore: 2¼"
Pump Setting: 8,100 ft.
Surface Stroke: 20 ft.
Production: 430 B/D
Previous Equipment: Subsurface Hydraulic Unit

CASE No. 3
PELTON
Model 512-8-30C-P
Pump Bore: 2¼"
Pump Setting: 6,800 ft.
Surface Stroke: 30 ft.
Production: 825 B/D
Previous Equipment: 108" Beam Unit

CASE No. 4
PELTON
Model 412-8-20A
Pump Bore: 2¾"
Pump Setting: 3,900 ft.
Surface Stroke: 20 ft.
Production: 1050 B/D
Previous Equipment: 74" Beam Unit

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Long stroke pumping produces more oil than the short stroke method because pumps with larger displacement can be operated at increased plunger travel. Compared to beam pumping, the same fluid weight can be lifted with less rod stress or more oil can be lifted at the same rod stress. Sucker rod stress loads up to 40,000 p.s.i. are practical with long constant velocity strokes and soft rod reversals. Shock loads, whipping and other rod fatigue and stress increasing forces are reduced to a safe working range.

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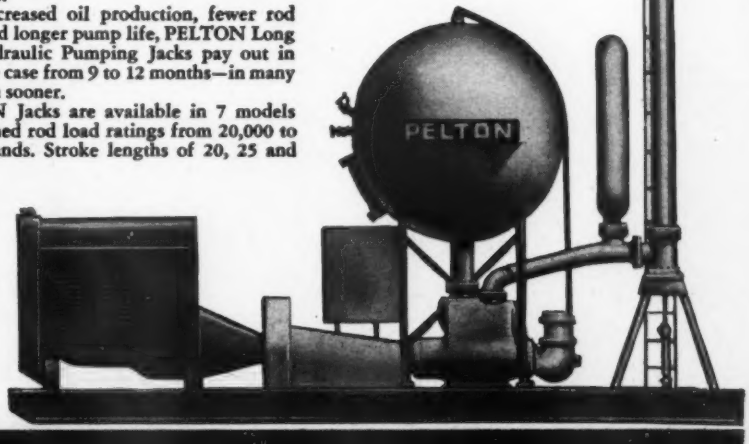

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C. K. BROWN

W. D. MASON, JR.

C. K. Brown has been with Maintenance Engineering Co. of Houston since 1935. In his 15 years with the company, he has specialized in production and gas-transmission instrumentation. His work has carried him to all parts of the United States where oil and gas are produced. Brown's present title with Maintenance is sales engineering. His college background is Texas A. and M. College where he studied mechanical engineering.

W. D. Mason, Jr., attended Lehigh University where he studied petroleum engineering. After leaving school, he joined Sun Oil Co. and worked in drilling, production, and pipe lining in Texas and Louisiana. In 1939, he left Sun to join General Crude Oil Co. as field engineer. During the war he served as a lieutenant commander in the Navy with duty which included a tour with the petroleum division of the Navy Department. After the war, he returned to General Crude as a reservoir engineer, his present capacity.

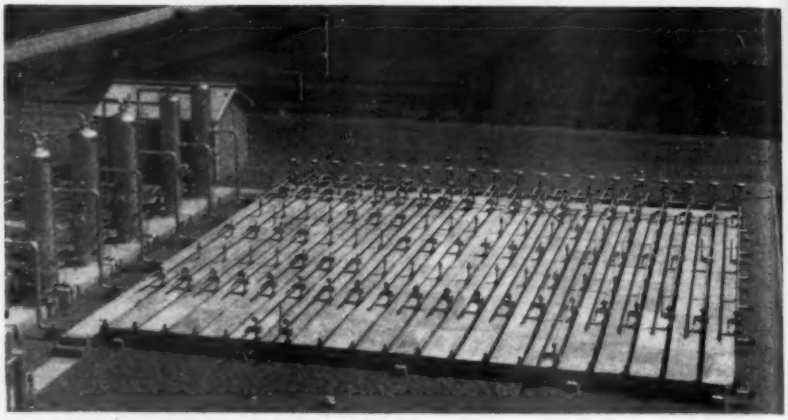
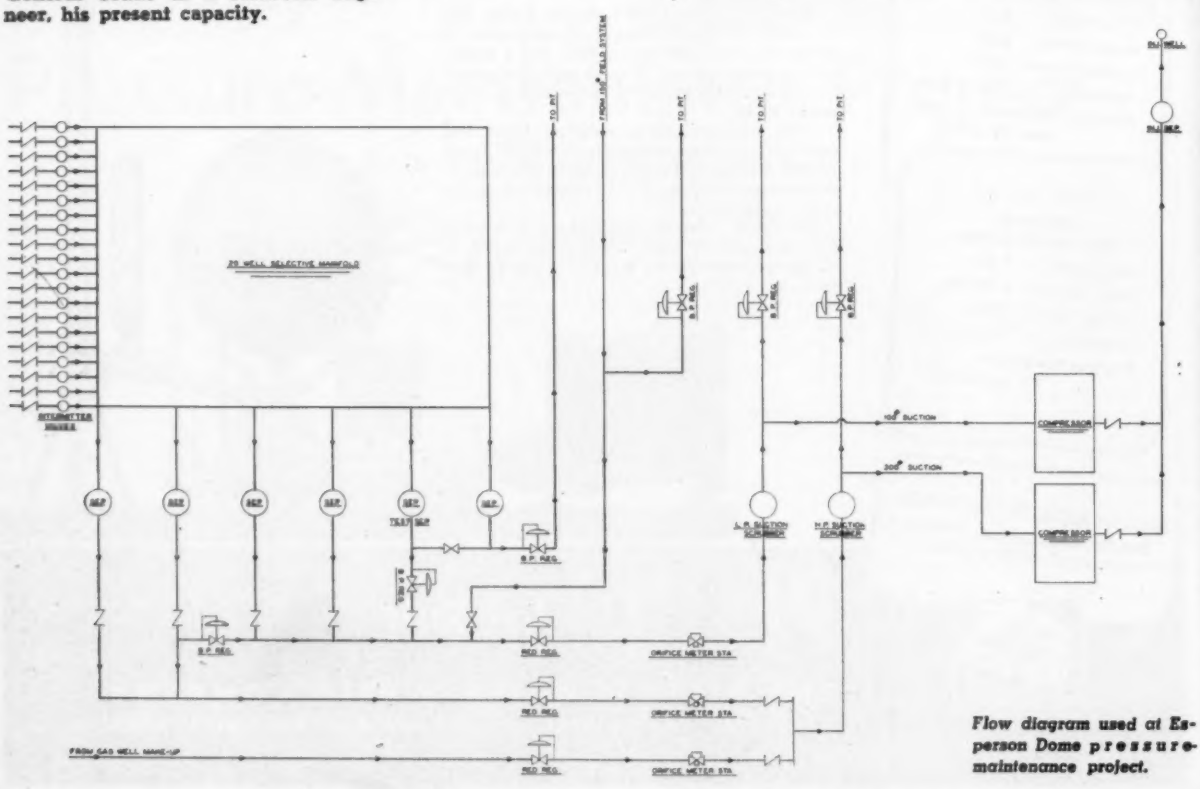


Fig. 3—This view from the top of the cooling tower shows the piping manifold which handles the 1,500 bbl. daily of oil from the field's 20 producers.

production first passes through chokes and then to a regulator which is operated by an electrically driven intermitting device. (See drawing.) This device controls the producing time of the individual wells. Of interest in the way of meters is a newly developed electrically driven orifice meter which gives a cumulative reading on gas flow. It is used in place of the conventional gas meter with a 24-hour chart.

The electrically driven intermitting device which controls the producing time of the wells is described by its manufacturers as a "20-unit time-cycle controller." It is electrically driven and has a small cam for each well, which revolves at the rate of one revolution per 24 hours. The pumper can install segments on each of these cams that will allow any desired flow rate on individual wells.

The time-cycle controller has pilot valves which are directly connected to diaphragm motor valves installed on the inlet side of the 20-well piping manifold (Fig. 3). Thus, the wells are automatically shut in and opened up for the desired periods of time. The diaphragm motor valves are of the normally-closed type whereby, if



Flow diagram used at Esperson Dome pressure-maintenance project.

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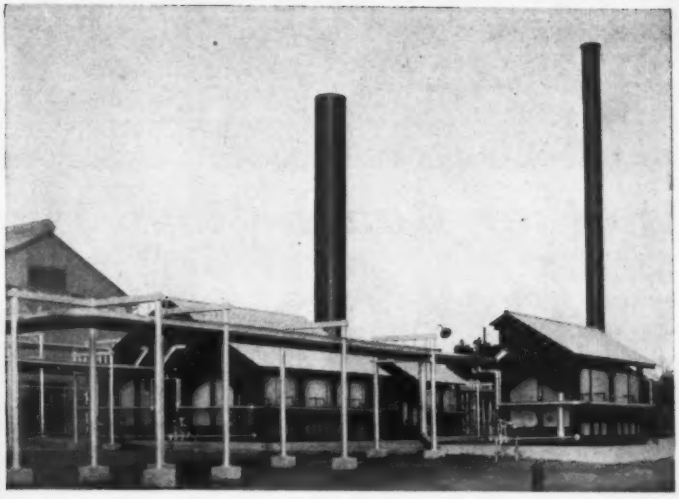

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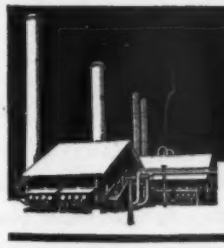

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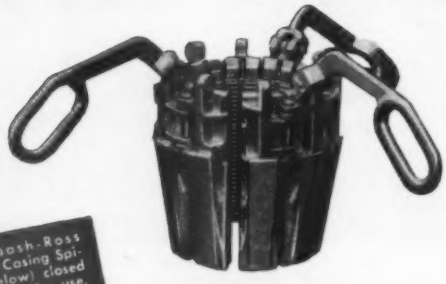

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The BAASH-ROSS HINGED CASING SPIDER

The Baash-Ross Hinged Casing Spider (below) closed and ready for use. Split Spider Bushings (right) lock in place to adapt Spider for smaller pipe sizes. Baash-Ross Type "UC" Casing Slips (top) are recommended for handling casing 7⅝" O.D. and larger. For smaller pipe use Baash-Ross "DU" or "2M.B." Rotary Slips.)

THERE HAS long been a need for a lightweight heavy-duty casing spider universally adaptable to practically any pipe-handling requirement. And here it is—The Baash-Ross Hinged Casing Spider. Though light in weight, it will safely support the longest and heaviest casing strings. And note its wide-range adaptability . . .

- You can place it directly on top of any type or size rotary table for supporting casing strings too large to be run through standard rotary master bushings. No need to remove the rotary table, no wasted time disconnecting the table drive and then reinstalling and realigning the table hook-up.
- Or, if preferred, you can use the Hinged Casing Spider on a platform that replaces the rotary machine.
- Or on workover, salvage and other operations where no table is installed, the Hinged Spider can be supported directly on cribbing, thus providing a quick and convenient method of handling casing and other pipe.

HINGED FOR QUICK EASY INSTALLATION!

By simply pulling a pin, the Baash-Ross Hinged Casing Spider can be quickly opened, thus permitting its installation without need for swinging the unit over any pipe that may be hanging in the well. The double pin arrangement not only permits the Spider to be opened on either side, but also permits the Spider to be separated into two parts for maximum ease in handling and transporting.

Hinge pins as well as handles are streamlined into the body contour, while a generous pipe-supporting platform and safety grid, low overall height and wide solid base all contribute to maximum safety and crane convenience.

MAXIMUM CASING ADAPTABILITY

Wide-range installation adaptability is only *one* of the features in the Baash-Ross Hinged Casing Spider, for it is equally adaptable to handling a complete range of pipe sizes 18⅝" O.D. and smaller.

The Spider is made in *four* basic sizes . . . 18⅝", 16", 13⅜" and 10¾" . . . and each basic size will not only handle the diameter of casing corresponding to its size designation, but can be readily adapted to handle any smaller size of casing by simply inserting removable Spider Bushings.

These Spider Bushings are split and are retained solidly in place whether the Spider is open or closed. And regardless of the basic size, each Casing Spider can be bushed down, if desired, to the bore and taper of a standard rotary master bushing, thus permitting the use of standard rotary slips for handling small casing as well as any other pipe sizes that can be supported in regular rotary slips.

Get full details on this new Baash-Ross Hinged Casing Spider from your nearest Baash-Ross representative—or write direct for additional data.

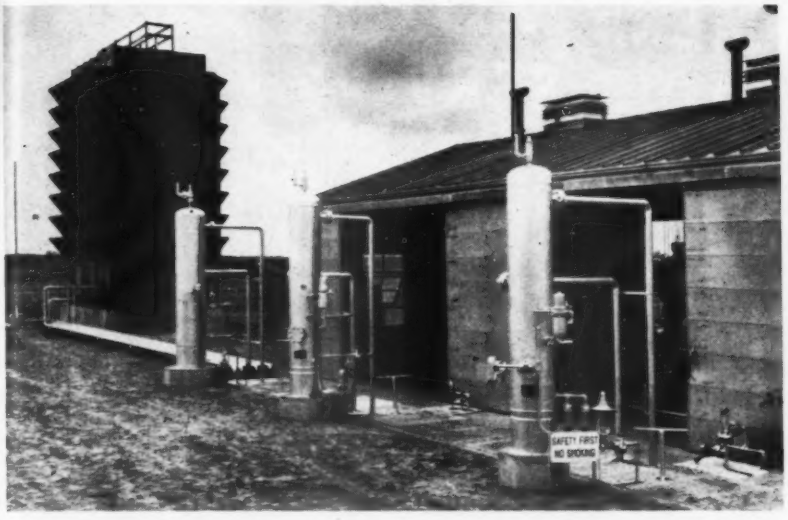

Fig. 4—Two 300-hp. compressors housed in this building are supplying 4,000 M.c.f. of injection gas daily at a pressure of 2,800 psi. The scrubbers, in foreground, are equipped with high-liquid, automatic shutdown devices.

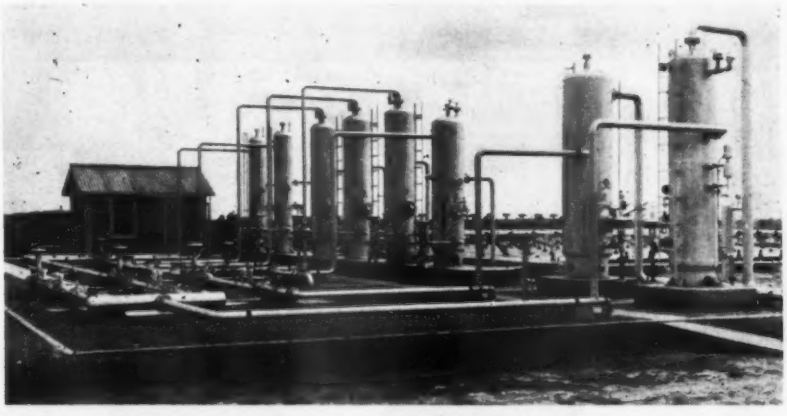

Fig. 5—Dual separation is performed on all production over 150 psi. pressure. It is interesting to note that any well in the field can be turned into any of the separators through existing piping.

the revolving cam is in the off position, the pilot supply pressure is bled from the diaphragm motor valve closing the well automatically.

An interesting sidelight on the installation of the well control equipment is the fact that hard copper tubing is used to transmit the gas supply. The tubing is laid in a concrete trench and covered by steel walkway. This type of construction was selected because of the ease and permanence of installation. In installing the tubing, wrought copper fittings were used and were silver-soldered in place.

The time-cycle controller is installed on a panel board (see Fig. 2) along with three ring-balance type self-integrating orifice meters, four pressure controllers, and pressure gages. One of the three orifice meters measures the gas supply into the low-pressure compressor, the second the gas supply into the high-pressure compressor, and the third measures the makeup gas supplied from extraneous sources. The pressure controllers regulate the supply gas entering the suction of the compressors. The pressure gages on the panel give readings on the field system, the high-pressure makeup gas, and the suction of each compressor.

After the incoming production from the field has passed through a check valve, positive choke, and the time-cycle controlled intermitter, it goes to one of six separators. The first is a high-pressure unit operating at an inlet pressure of approximately 400 psi., and an outlet oil pressure of 150 psi. The oil from this high-pressure vessel undergoes further separation in the second separator—a 150-psi. unit. This second separator also performs primary separation on 150-psi. oil from the field.

The third separator is for wells producing oil at pressures below 150 psi. The fourth and fifth units are used for dually separating those wells producing water. This oil is handled separately and goes through a treater before going to storage. The sixth separator is used for test purposes. It is equipped with an oil meter and an orifice gas meter for determining gas-oil ratios. It is noteworthy that any well in the field can be turned into any of the six separators.

The high-pressure gas from the 400-psi. separator is reduced to 300 psi. to supply the suction of one of the two 300-hp. compressors used for the pressure-maintenance program. The gas from the 150-psi. separator is reduced to 100 psi. to supply the suction of the second compressor. Diaphragm motor valves with pressure

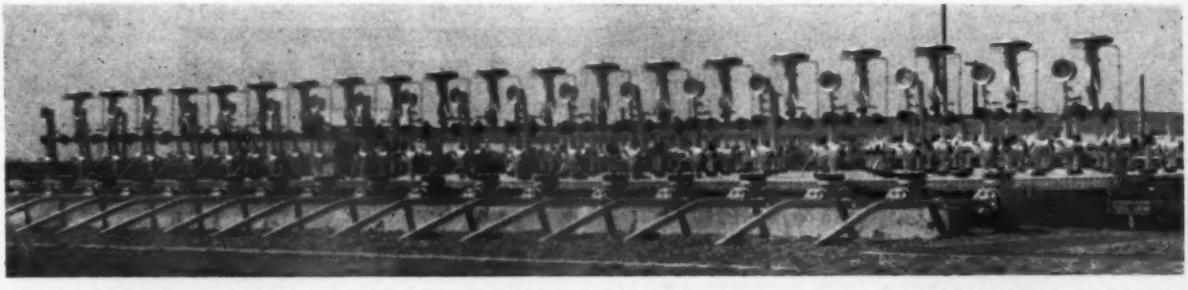

Fig. 6—Production from the field enters the piping manifold through the check valves, positive chokes, and time-cycle controlled intermitters shown in this picture.

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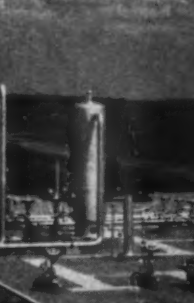

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controllers maintain the desired suction pressures on the compressors.

To insure a continuous gas supply for the compressors, makeup gas is available. A high-pressure gas well in another reservoir will feed the high-pressure compressor. Makeup for the low-pressure system is available from casing-head gas produced in another part of the field. The high-pressure machine is equipped with an automatic shutdown device in case the gas supply fails.

The compressor handling the low-pressure gas is a three-stage unit while the other compressor is two-stage. Outlet pressure of the injection gas is 2,800 psi. Since the gas is fairly dry, a small quantity of liquids drops out of the gas. However, scrubbers equipped with high-liquid, automatic shutdown devices have been installed between each stage. As an ample water supply is available, water cooling is used for the compressed gas. A 4-in. discharge line carries the 2,800-psi. gas to the injection well.

Since the discharge line to the injection well is approximately ¾ mile long, some freezing trouble was encountered during cold weather. This has been remedied by burying the line and installing a fluid trap to drain off the water at a place where temperature is still above the freezing point.

An outstanding feature of the South Esperson installation is that one man per tour can operate the entire installation. He can act not only as pumper, but as engineer at the compressor station.

Safety Features

A number of safety features have been incorporated in the installation. The entire operation can be shut down with a single control. The operator by shutting off the supply gas to the intermitter controls, diaphragm control valves, and pressure regulators can immediately shut in the 20 wells, shut down the compressors, and vent any gas in the system to the air. Another safety feature is the check valves which have been placed at each well inlet and at the discharge of the compressor units. This eliminates any possibility of high-pressure gas getting back to the compressors, or any individual well flowing against another well in the piping manifold.

The entire 20-well selective manifold was fabricated for a working pressure of 3,000 psi. Hence, if necessary, the operator can close any connection to any separator and allow full well pressure to be exerted on the manifold without damage.

Maintenance Engineering Co., Houston, fabricated and supervised the construction of the well manifold. The compressor station was installed by O. L. Olsen, Houston. Hudson Engineering Co., also of Houston, designed and constructed the cooling tower.

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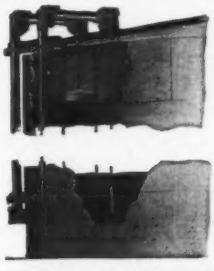

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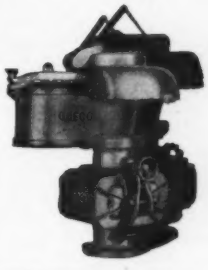

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OCEAN WAVES . . AND MARINE OIL OPERATIONS

by Dale F. Leipper

A MAJOR portion of The Oil and Gas Journal for February 23, 1950, was given over to a symposium on design of offshore drilling structures. The symposium dealt largely with the damage done to platforms by the hurricane of October 3, 1949, in which Ohio Oil Co. suffered losses exceeding $200,000. It consisted of papers by experts in the fields of design, engineering, meteorology, and insurance. Since two independent research organizations are now engaged in blueprinting a program for an investigation of damaging forces in hurricanes, it seems appropriate to discuss further some of the important considerations involved.

In the course of the Journal's symposium it was brought out that there are two ways in which offshore structures may be altered so as to withstand the damaging effect of hurricane waves. One way is to strengthen the structure or to reduce its wave resistance, and the other is to raise the platform above the zone of wave action.

In their articles, the symposium authors are in general agreement upon five important points:

1. That forces doing the major damage are vertical forces associated with ocean waves.

2. That elevation of platform decks above the zone of wave action is the best means for preventing further damage in hurricanes.

3. That many additional data concerning ocean waves and oceanographic conditions are needed.

4. That the Sverdrup-Munk wave theory is probably not applicable to the special situation of hurricanes on the Continental Shelf of the Gulf of Mexico (although one author, Krick, used this theory without discussing its limitations in computing wave heights at the platforms, thus indicating that he does not agree on this point).

5. That the standard weather forecast made for the general public does not contain all the information an offshore operator desires or needs, especially as regards the state of the sea.

On the basis of these points, the primary question which must be answered for the offshore industry is: **For each given drill site, what is the maximum elevation of wave crest above the bottom which is probable?**

Dale F. Leipper is department head of Texas A. & M.'s newly organized department of oceanography. He has had wide experience as a physical oceanographer and marine meteorologist. The new department at Texas A. & M. is the only one of its kind on the Gulf Coast, and it has available a complete shore laboratory.

The answer to this question will come only from the sciences of climatology, meteorology, oceanography, and probability. There is no way in which it might be obtained from engineering methods alone, unless measurements could be taken at every site over a period of years long enough to establish the probabilities of occcurrence of various hurricane wave heights. This is obviously impractical.

Secondary problems deal with the forces exerted by waves on platform structure below the main deck. According to M. B. Willey, one is led to believe that "the designs now in use are satisfactory. Structures so constructed will remain intact in even a severe hurricane provided the decks and other flat surfaces of considerable area are out of the reach of the wave mass." Further knowledge of the distribution of forces in waves can aid greatly, however, in increasing the efficiency of structure design. From a suitable series of observations collected at times and places known from oceanographic considerations to be typical or critical, the necessary empirical knowledge can be obtained.

The complicated nature of ocean waves is such that, even in regions where recording devices are operating, it usually appears that the most valuable information on waves can be obtained by the application of an appropriate oceanographic theory which makes use of detailed meteorological and geological data. Such a theory is needed to permit the computation of wave characteristics for the short fetches, the shallow waters, and the hurricane wind speeds peculiar to the Gulf Coast. Only on the basis of a sound theoretical framework may a series of observations be carried out which will permit the eventual perfection of an applicable theory. Only by incorporation in such a theory will observational material find its maximum value and provide means for prognosticating wave characteristics at different times and places under varying conditions.

It should be emphasized that the only satisfactory solution of the hurricane wave problem will come from

Grand Isle, La., laboratory of Texas A. & M. College Research Foundation.

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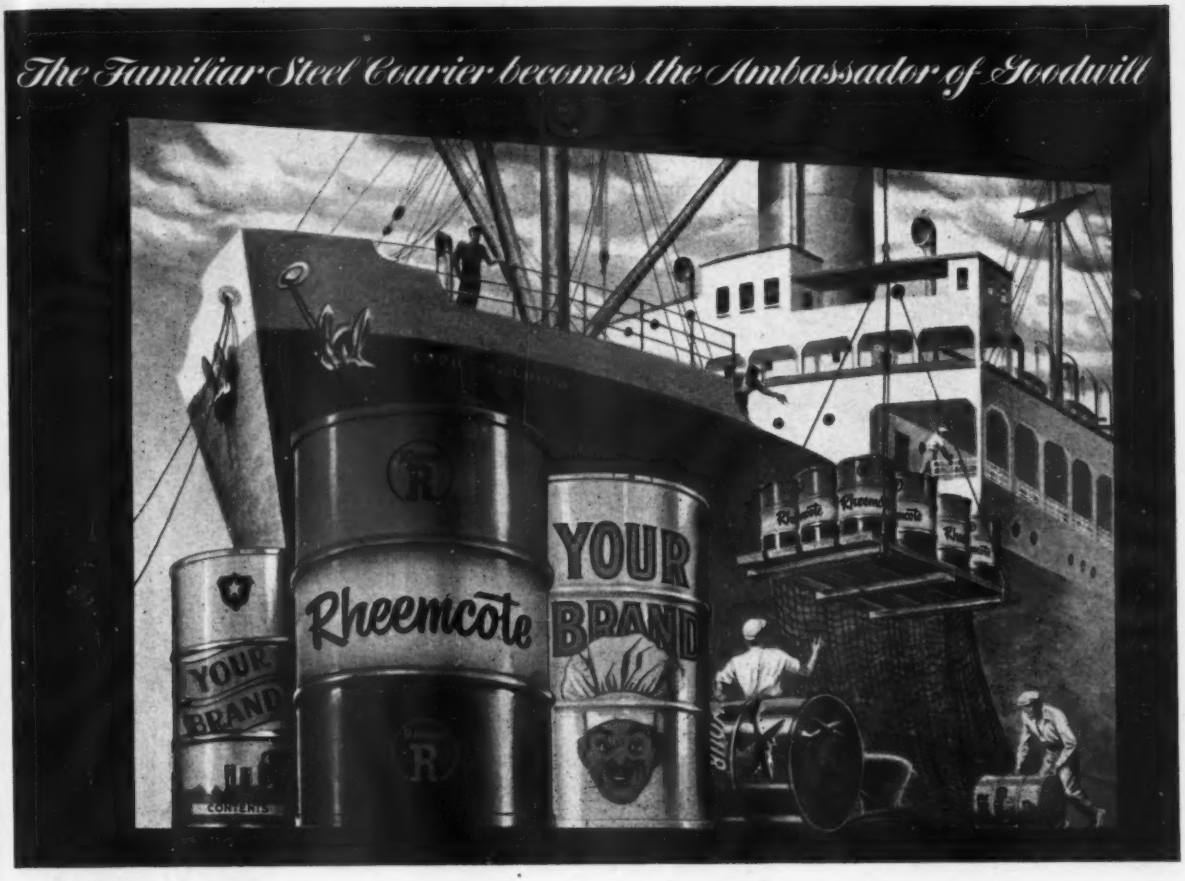

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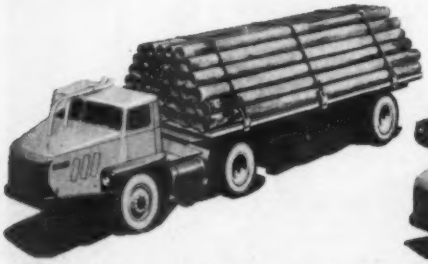

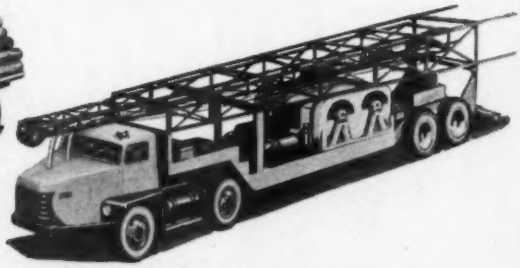

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Relation Between Engineering and Oceanography

Studies of the properties of sea water and of materials contained in it are the responsibility of the oceanographer. Some of the particular properties to which attention must be given are electrical conductivity, diffusive characteristics and the manner of transmission of sound, light, and heat. Results obtained by study of such properties are useful to the engineer. For example, in an investigation of corrosive properties of sea water in heat exchangers one company found in more efficient to operate a $10,000 heat exchanger than a $3,000 one.

If we consider forces, the major ones operating in the oceans are those related to the tides, wind waves, currents, hydrostatic pressures, heat energies and stresses of the wind on the sea surface.

Proper interpretation and application of knowledge concerning these forces requires a combination of theoretical work and engineering. Such a combination will prevent needless effort being spent in the development of theories which have no application and in the application of theories which have assumptions not met in nature.

Engineers and oceanographers have worked separately on their common problems. Closest cooperation was probably obtained in University of California but even there the two departments concerned were separated by 600 miles. The engineering department at Berkeley has successfully engaged in projects related to sea-water distillation, ripple waves in tanks, formation of gravity waves, stability of ship models, wave energy, wave recorders and amphibious craft and their operation. Some studies have been conducted jointly with the Scripps Institution and others have employed meteorologists and oceanographers working in the department of engineering.

On the Gulf Coast, engineers have faced many difficult marine problems but have as yet sought relatively little help from physical or meteorological oceanographers. One reason is that there has been only one such specialist in this region. The academic positions open in the department of oceanography at Texas A. & M. now make it possible to overcome this difficulty.

Our Gulf Coast has a unique set of problems. In addition to those arising here in engineering owing to the action of ocean waves, currents, tides, and winds, there are others brought about by the growth of organisms and by chemical reactions. These problems involve beach erosion and sedimentology, fouling, effects of weather, corrosion, fresh-water supply, navigation, extraction of raw materials from the sea, sanitation, recreation, defense, and offshore construction and operation. The Gulf Coast needs a well coordinated local oceanographic program similar to the ones conducted on the Atlantic and Pacific coastlines.

Nature of Oceanographic Research

There are a number of characteristics which practically all oceanographic investigations including wave studies have in common. One of these is the tendency to become more and more involved in a wider and wider range of marine subject matter as the investigation advances. Another is that there are a surprisingly large number of similar parts making up oceanographic projects which, on the surface, would appear to be entirely unrelated. As a result of these characteristics there are two alternate approaches to oceanographic research. The first is to attack the problem immediately at hand and then to find it becomes gradually more and more involved in other phases of oceanography. The second approach is to plan a comprehensive investigation which consists of a united attack upon the basic aspects of the science which are pertinent.

One of the most vital parts of an oceanographic research program is the development of a group of men

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who are expert in local problems. Benefits obtained from the influence of these men, who are living and working in the region where the research is being conducted and where the results are applied, may far exceed benefits derived from their formal, published technical reports.

Ocean-Wave Research

As an example of an investigation which illustrates many of the characteristics of oceanographic research projects as described above, we may consider an ocean-wave investigation. At the Scripps Institution of Oceanography, the writer was studying waves under H. U. Sverdrup in the summer of 1943, when wave research was begun there.

From that time on, such work has been continually conducted a La Jolla. The Scripps Institution's wave theory have been used by one of its authors, W. N. Munk, in the absence of any more applicable theories to compute wave heights in Gulf Coast hurricanes. However, the limitations of this theory in the hurricane situation have always been carefully discussed. Krick has implied that the theory is applicable in its present form. Evidence opposed to this application is as follows:

First, the fact that maximum waves observed October 3, 1949, greatly exceeded those computed from this theory by Munk. Second, wave heights were computed by Krick subsequent to the hurricane, which was not an intense one, using the same theory and he got wave heights 61 per cent greater than those of Munk. Third, two references may be quoted—the first written by a student of Sverdrup and approved by him.

"Since the evaluation of the constants in the Scripps Institution wave theory is based on observations which do not include the special features of the tropical storm, the conclusions reached in this paper will have to be modified as more detailed observations of the sea and swell associated with these storms are made." (Waves and Swell from a Tropical Storm, Chief of Naval Operations, Aerology Section, Washington, D. C.)

Also, William L. Donn in the August 1949 issue of the American Geophysical Union Transactions states ". . . (1) the forecast theory of Sverdrup and Munk appears inapplicable to storms in which the velocity of the winds is high and the fetch is short."

It shall be kept in mind that the Sverdrup-Munk theory has found application in a wide variety of other situations and that it is chiefly on the Gulf Coast hurricane situation that major difficulties arise. Additional work must be done, giving particular attention to the short fetches, high wind velocities, and shallow waters which are found there. It is quite likely that many aspects of this previous theory may be modified and made applicable when suitable empirical data have been obtained.

The Scripps wave work began with work by one scientist, Sverdrup, but grew until it has at various times received the sponsorship of the Army Air Forces, the Hydrographic Office, the Bureau of Ships, the Office of Naval Research, the U. S. Marine Corps, the Geophysics Institute of University of California, the Beach Erosion Board, the U. S. Army Engineers, and different industries. In addition to sponsorship, these agencies furnished cooperation of various kinds such as the use of airplanes, ships, and instruments; the assignment of men to participate in research; the sponsorship of students by providing funds for research assistantships, and technical advice. There was cooperation with other organizations such as the department of engineering at Berkeley which conducted model studies, developed methods of observation, designed instruments, and made engineering applications of wave data. Meteorological information was furnished by the U. S. Weather Bureau and the department of meteorology at University of California at Los Angeles. Geologists conducted studies of changes in topography, sedimentation, and erosion which provided information on wave action. Such widespread cooperation could not have been furnished to other than a educational institution.

The wave work has been conducted over a period of 7 years with major contributions by Sverdrup and Munk. During most of this time the personnel participating also included a draftsman, a secretary, a computer, and various graduate students in physical oceanography. This gives an idea of the scope of a

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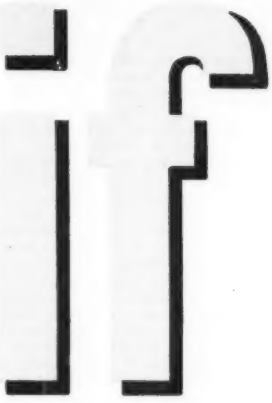

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successful project on ocean waves. With the results of this work available, the development for the Gulf Coast region will be somewhat simplified, although still extensive. However, because of the number of agencies interested, no one group of industries need carry the full burden of sponsorship if the program is properly planned.

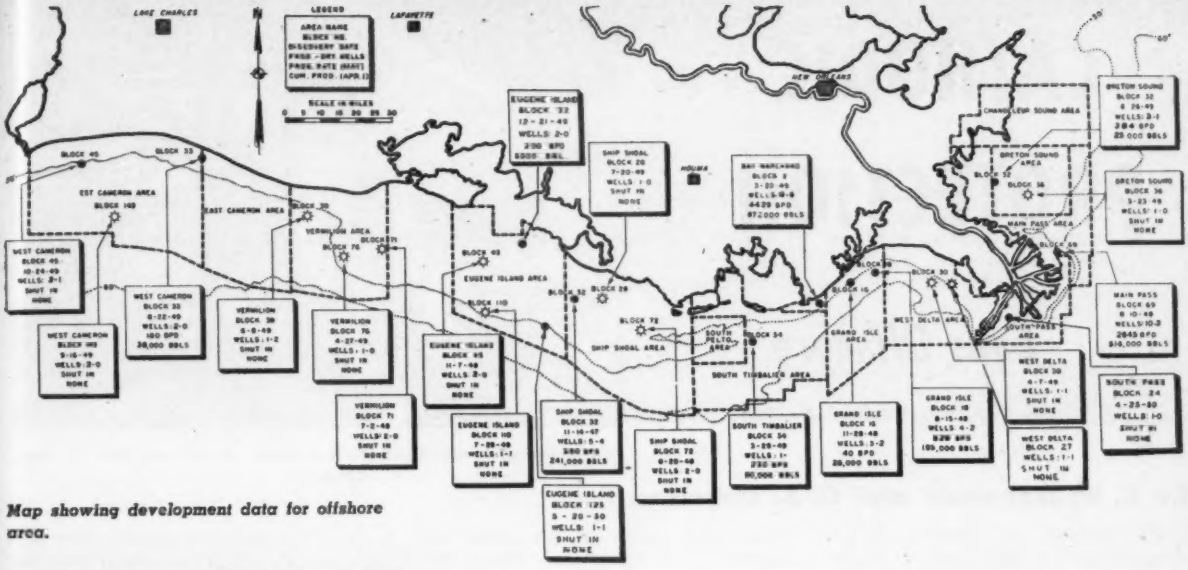
The Beach Erosion Board has already assisted in local wave studies, having furnished a wave-recording instrument. Dr. Martin Mason, who is chief of the engineering and research section, has received requests from other companies for similar recording instruments. However, such equipment cannot be issued until there is assurance that a satisfactory coordinating agency in wave work has been selected. Other organizations such as the Office of Naval Research would no doubt contribute to the sponsorship of basic work on hurricanes under conditions which exist here. Also, the staff of the A. & M. department of oceanography is planning work on waves in conjunction with its academic program.

The basic problem is to determine how the wind acts on the sea surface to set up and modify waves and currents. The Eckman theory, which is now used to calculate currents, is known to be inadequate. The oil platforms offshore provide a unique opportunity to obtain for the first time the information which is needed to revise this theory. Texas A. & M. has a staff position for another physical oceanographer - marine meteorologist and expects to select for the position the best qualified available man for work on oceanographic waves and currents, combining the theoretical and the practical approaches, who may contribute to the solution of pertinent problems.

There are a number of oceanographic and engineering problems which are related to waves and are of particular importance along this coast. One of these concerns the applicability of the model laws. When the wind exceeds 7 m. per second the ocean surface changes in character, becoming hydrodynamically rough. This phenomenon is a basic one in the study of waves and currents and probably cannot be reproduced or allowed for in model studies. Another problem is the determination of the distribution of the forces in ocean waves. One present theory states that the force is maximum at the crest because particle velocities are maximum here. It should be remembered that this part of the wave has the least mass and therefore in spite of its velocity may not have great striking power.

There are few data indicating the height of storm tides offshore although this information is vital to construction engineers. A simple device could be made to obtain such data. This might consist of a large piece of pipe such as is used with tide gages having a sealed bottom except for one small subsurface hole large enough to permit water level in the pipe to change over a period of several hours, but small enough that passing wind waves would have no effect on the water level. A value could be put into the hole to allow water to pass slowly into the hole but not out. Thus, after the hurricane, the stand of water in the pipe

(Continued on page 327)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BRETON SOUND BLOCK 32 6-26-49 WELLS: 3-1 284 BPD 25,000 BBLS
BRETON SOUND BLOCK 36 3-23-49 WELLS: 1-0 SHUT IN NONE
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GRAND ISLE BLOCK 16 11-28-48 WELLS: 3-2 40 BPD 28,000 BBLS
GRAND ISLE BLOCK 18 8-15-48 WELLS: 4-2 829 BPD 109,000 BBLS
WEST DELTA BLOCK 30 6-7-49 WELLS: 1-1 SHUT IN NONE
WEST DELTA BLOCK 27 WELLS: 1-1 SHUT IN NONE
CHANDELEUR SOUND AREA
MAIN PASS AREA
SOUTH PASS AREA
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GRAND ISLE AREA
SOUTH TIMBALIER AREA
SHIP SHOAL AREA
EUGENE ISLAND AREA
VERMILION AREA
EAST CAMERON AREA
WEST CAMERON AREA

Map showing development data for offshore area.

STATUS REPORT ON

OFFSHORE DRILLING IN LOUISIANA

by A. L. Vitter, Jr.

IT may be surprising to some to learn the extent of offshore operations today. This report gives the current status and history of the development. The illustrative map gives data for the Louisiana coastal area, as at the present. The old Creole field less than a mile off the Cameron Parish coast which was discovered in 1938 is not included in this survey of the postwar offshore operations, although it was the first of this new operation and 10 years ahead of its time.

In the postwar development, the record is as follows:

The first discovery.—Made by Kerr-McGee Oil Industries, Inc., et al., in Ship Shoal Block 32 field on November 14, 1947. Field is a piercement-type salt dome, the discovery well encountering the top of the salt at 2,563 ft. The first well was completed at approximately 1,700 ft. making 600 bbl. per day of oil.

The present five wells had a May 1950 allowable of 380 bbl. per day from sands at depths from 1,700 to 3,200 ft. Approximately 241,000 bbl. had been produced as of April 1, 1950.

Second oil field.—Main Pass Block 69, discovered by The California Co. on August 10, 1948. May 1950 allowable was 2,645 bbl. per day for 10 wells. Had produced 514,300 bbl. to April 1, 1950.

This field is the only offshore field to date to have more than one operator, Shell Oil Co. having completed its first offshore oil well in it on February 25, 1949.

A. L. Vitter, Jr., is head of the petroleum engineering division of The California Co., New Orleans. He received his bachelor of science degree from Notre Dame in 1935; continued in graduate work in physics and received master of science degree in 1937, after which he spent 1 year in teaching and research at Notre Dame. From 1938 to 1942 he was a petroleum engineer with the Louisiana Department of Conservation and devoted a large share of his attention to gas-condensate cycling, pressure maintenance, and secondary recovery.

No salt has been reached to date and the wells are producing from sands at 5,800 and 8,200 ft.

Third offshore field.—Discovered by Humble Oil & Refining Co. on August 15, 1948, in Gulf Isle Block 18. This is a piercement-type salt dome with top of the salt at 8,600 ft.

The four wells had a May 1950 allowable of 828 bbl. per day; had produced 195,721 bbl. as of April 1, 1950.

Fourth field.—Grand Isle Block 16 discovered November 23, 1948, by Humble. Another piercement-type salt dome.

Production is from 4,600 and 6,100 ft. and the May allowable was 40 bbl. per day. Cumulative production to April 1950 was 25,600 bbl.

Fifth field.—Bay Marchand Block 2 discovered March 20, 1949, by The California Co. This is also a piercement-type salt dome, the salt on top of the dome having been encountered at 2,120 ft.

Production is from varicus sands between 3,000 and 6,000 ft.

Development in this field is further advanced than any other offshore field and the May 1950 allowable for its 19 wells was 4,429 bbl. per day. Cumulative production to April 1 was 672,250 bbl.

Subsequent fields discovered.—In order, these are: South Timbalier Block 34 by Humble, West Cameron Block 33 by Kerr-McGee, Breton Sound Block 32 by Barnsdall Oil Co., West Cameron Block 45 by Stanolind Oil & Gas Co., Eugene Island Block 32 by Pure Oil Co., Eugene Island Block 125 by Magnolia Petroleum Co., and South Pass Block 24 by Shell. This is a total of 12 oil fields to date.

Eleven gas fields.—See map for location. There has been no attempt to produce these gas fields so far, and they have been shut in since discovery. However, plans are now being made to produce gas from one of the fields by laying a pipe line to shore.

Drilling wells.—There are 16 wells drilling in the Louisiana offshore, 12 of which are development wells in fields and 4 of which are wildcats.

Acknowledgment

Statistics prepared by Paul F. McLain of The California Co.

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CATHODIC PROTECTION

Goes Offshore

Fig. 1—Corrosive attack on platform jacket at the mud line (2 years' exposure).

by E. P. Doremus and G. L. Doremus

THE number of offshore drilling platforms in the Gulf of Mexico has increased rapidly during the past several years, with the greatest activity to date off the Louisiana coast. Steel platforms of considerable size and cost are necessary to offshore operations.

The design of structures capable of supporting heavy drilling equipment in the open gulf at depths up to 50 ft. has become a more exact science as additional data and experience have been gathered on offshore conditions during such operations. Of particular value in this respect was information derived from the hurricane of October 1949, which passed within a few miles of two of these platforms near Freeport, Tex.

Most of the existing platforms are of the template or jacket type, with extensive underwater bracing. There are in addition many platforms which are supported by a relatively small number of large-diameter pipe piles. Some of these have no submerged bracing, while others are cross-braced with 1½-in. galvanized pre-stressed bridge cable.

Corrosion Problems Involved

Corrosion is, and will continue to be, a major problem on these structures, a problem involving both the design and operating engineering groups. Steel piling in sea water has been shown to corrode most rapidly in the splash and spray zone. Fortunately, these surfaces and those lying above may be protected to a reasonably satisfactory degree by paint or bituminous coatings. It is corrosion of the submerged platform surfaces which gives cause for most concern, particularly where production is obtained and long service life is required, since protective coatings have a relatively short life below the water line and renewal is impractical if not impossible.

Underwater corrosion rates on bare steel piling in sea water are highest just below the tidal zone and just above the mud line, these being the anodic sections on the piling. Corrision of the horizontal bracing on a platform jacket just above the mud line which occurred during only 2 years of service is shown in Fig. 1. There is good reason to believe that this is the most critical zone in the case of steel piling in such service.

Until very recently the only recourse for the design engineer was to accept underwater corrision as inevitable and to overdesign accordingly. This, of course, added appreciably to the cost of offshore operations, which were already discouragingly expensive.

Within the past 2 or 3 years, however, both experimental and practical applications have demonstrated that properly installed cathodic protection can practically eliminate corrosion on the submerged portions of steel piling in sea water, while corrision rates in the tidal zone under conditions of alternate immersion are reduced roughly in proportion to time of immersion. Presented with this solution to the underwater corrision problem, most offshore operators have been quick to adopt cathodic protection, and to date such protective systems have been installed on at least 20 platforms and four converted L.S.T. drilling tenders used in offshore operations. Total submerged area under protection is estimated at nearly 1,000,000 sq. ft.

The cathodic protection of steel in sea water, using as criterion of protection the establishment of steel potentials more negative than 0.78v, referred to a saturated calomel electrode, initially requires 10-15 ma. per sq. ft. However, if the surfaces to be protected are first polarized at high current densities, i.e, 50-350 ma. per sq. ft. for a few days, current requirements for protection can be reduced to only 3 ma. per sq. ft. or less. This treatment serves to lay down on the steel surfaces a calcareous coating consisting principally of calcium carbonate and magnesium hydroxide,

The Authors

E. P. DOREMUS

G. L. DOREMUS

E. P. Doremus is managing partner of Cathodic Protection Service, Houston, consulting and contracting corrosion engineers. He received his M.S. degree from Louisiana State University and began work in research and development with Shell Oil Co. at Deer Park, Tex. In 1942 he went to Old Ocean, Tex., as chief chemist of the J. S. Abercrombie Co, aviation-gasoline plant. In 1945 he went into partnership with H. A. Grebe. With Grebe, he is also partner of Grebe & Dormeus Process Co., refinery and gass process design engineers.

G. L. Doremus is senior corrosion engineer with Cathodic Protection Service. He received his B.S. (1939) and M.S. (1941) both from Tulane University and joined the staff of the Southern Regional Research Laboratory of the U. S. Department of Agriculture in New Orleans in 1941. After a tour of duty in electronics in the Navy, he returned to the USDA briefly before assuming his present position in 1947.

Jackknife derrick being moved at Pierce Junction.

Close-up showing jacks in position on derrick moved at Winnie, Texas.

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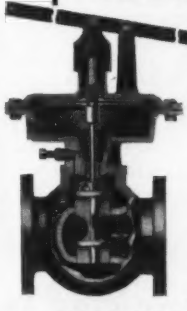

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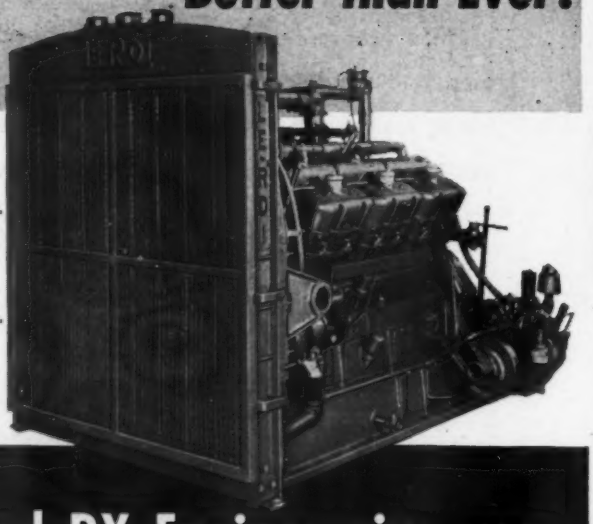

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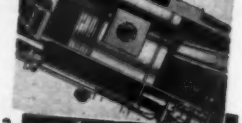

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Fig. 2—Protective calcareous coating deposited on steel piling by polarization treatment (low tide).

Fig. 3—Installing magnesium ribbon for polarization of L.S.T. drilling tender at offshore location.

the ratio between the two depending upon the actual current densities employed. Most dense coatings are formed at 100-200 ma. per sq. ft., where the Mg/Ca ratio is approximately unity. Best results are obtained if total current per square foot falls in the range of 6-10 amp.-hr. The manner in which this calcareous deposit may form beneath and displace portions of the barnacle layer on a piling during the polarization treatment is shown in Fig. 2.

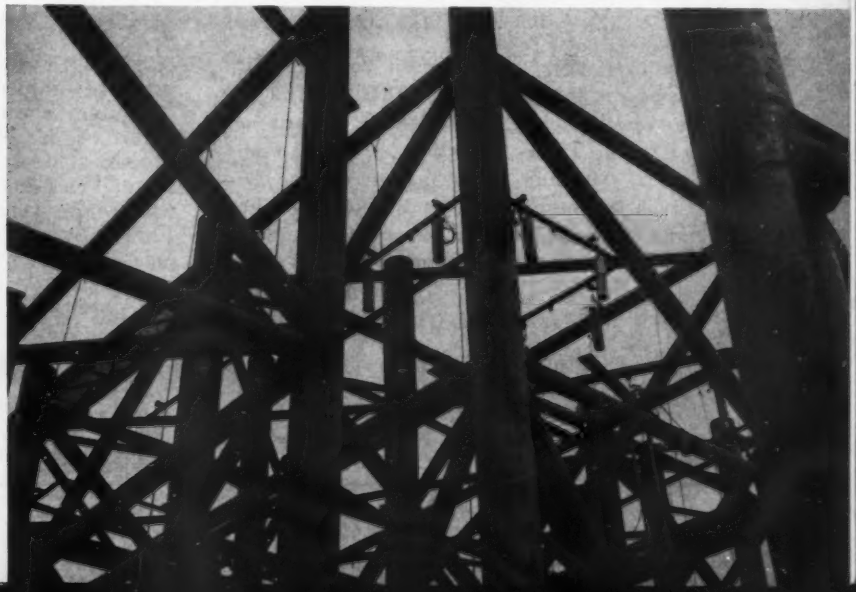
Use of the high-current-density technique, which in effect stabilizes current requirements with respect to time, reduces the size and hence the cost of the initial installation. It may be readily justified economically in terms of ampere-hour savings during the first year of operation, even though the process is patented and a small license fee is involved in its use.

Rather large quantities of direct current are required for these protective installations. For example, a platform with a total submerged area of 25,000 sq. ft. will demand a minimum of approximately 1,250 amp. for polarization and 75 amp. for subsequent maintenance of protective potentials and the calcareous coating. The most convenient and reliable source of such currents has been sacrificial magnesium anodes, which are readily available in forms which are specially suited to marine applications; all systems installed to date on offshore platforms in the gulf have utilized magnesium anodes as source of protective current. Magnesium develops nearly 1 volt against steel in sea water, so that the necessary current densities can be achieved with installations of moderate size.

To supply the polarization current, a ⅜ by ¾-in. magnesium ribbon with iron wire core is used. This material is distributed about the platform in short lengths and delivers approximately 0.5 amp. per lineal foot against an unpolarized structure in sea water. A copper lead wire of suitable length is attached to one end of each length of ribbon, and electrical connection to the structure is made by brazing the lead wire to any convenient member above the water line. This ribbon is completely consumed in 7-10 days, the total ampere-hours delivered being fully adequate for polarization purposes. The installation of this ribbon on the stern section of an L.S.T.

Fig. 4—Twin magnesium-anode assembly ready for installation on offshore drilling platform.

Fig. 5—Magnesium anodes installed on platform jacket while still on shore.



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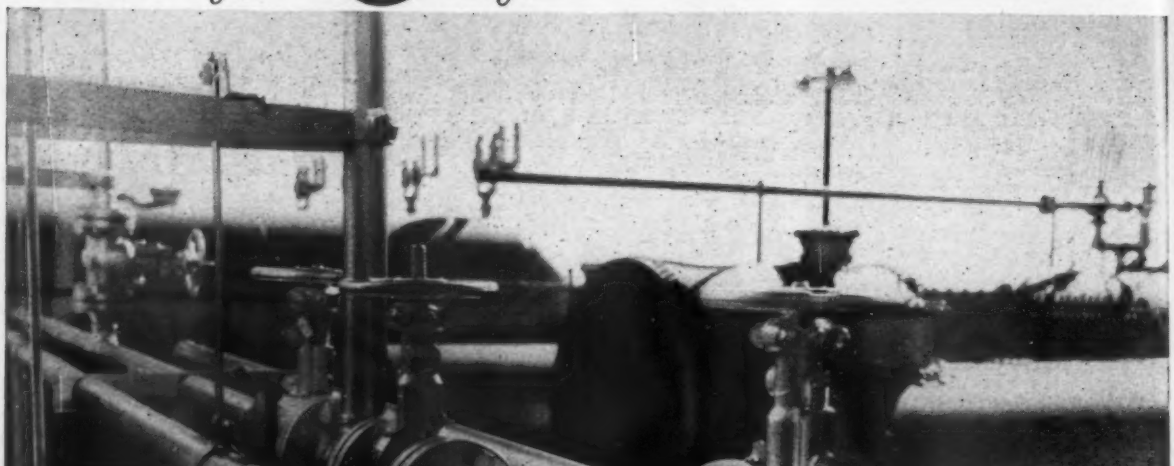

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tender at an offshore platform is illustrated in Fig. 3.

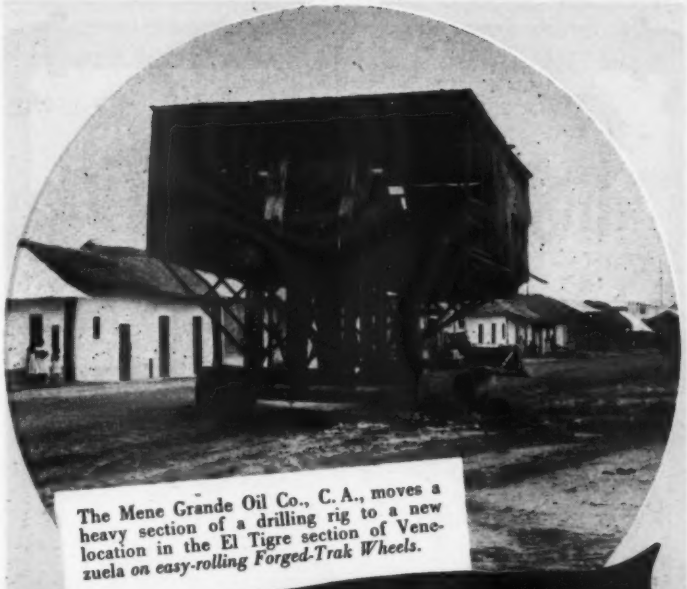
Fifty-one-pound magnesium anodes have been used to supply the cathodic protection or maintenance current (3 ma. per sq. ft.) after polarization. These anodes are suspended from the platform by means of copper cables in most instances. However, in some exceedingly rough locations it has been necessary to suspend the anodes on galvanized steel cable or steel rod. To reduce the number of anode supports required, two anodes are usually suspended on a single cable or rod. One procedure which has been used extensively is to weld the two anodes together by means of their ¾-in. pipe cores, which are centrally cast, thus forming a single 102-lb. unit. Such a twin anode assembly ready for installation on an offshore platform is shown in Fig. 4.

In most installations the anode string suspension is insulated from the platform so that the connection to the platform can be made through a shunt and current limiting resistor. These circuit elements, which are housed in protective enclosures, serve to facilitate current measurement and adjustment, respectively. It is considered desirable to limit anode outputs to project some predetermined anode life, generally 2 years; the 51-lb. anode is nominally rated at 1.8 amp. for 2-year life. A further advantage of this procedure is to make resurveys of the protective system much easier, so that an accurate tab on performance can be kept at all times.

Anode strings are distributed about the platform in a manner governed by estimated distribution of the submerged surfaces, with all strings located inside the outer row of pilings for protection. In the case of the L.S.T. tenders, the anode strings are confined to the bow and stern sections and are suspended from removable brackets to permit safe storage of the strings while changing location.

Since the well heads and casing strings associated with each platform are necessarily included in the protective system, these important items receive full protection in the upper zones; theoretically protection tapers off with depth in logarithmic manner. It has been found that a satisfactory allowance for each conductor pipe and associated casing strings is 2,000 sq. ft. If they are not already electrically connected by platform bracing and production equipment, such bonding must be completed prior to the polarization treatment.

In general, there are no special precautions necessary in connection with the operation of these cathodic protection systems. Where pipe lines are connected to the platforms, these will receive full protection for 3 or 4 miles if well coated or wrapped, or for only a few hundred feet, if bare. Should oil produced be moved by barge instead of pipe line, it is im-



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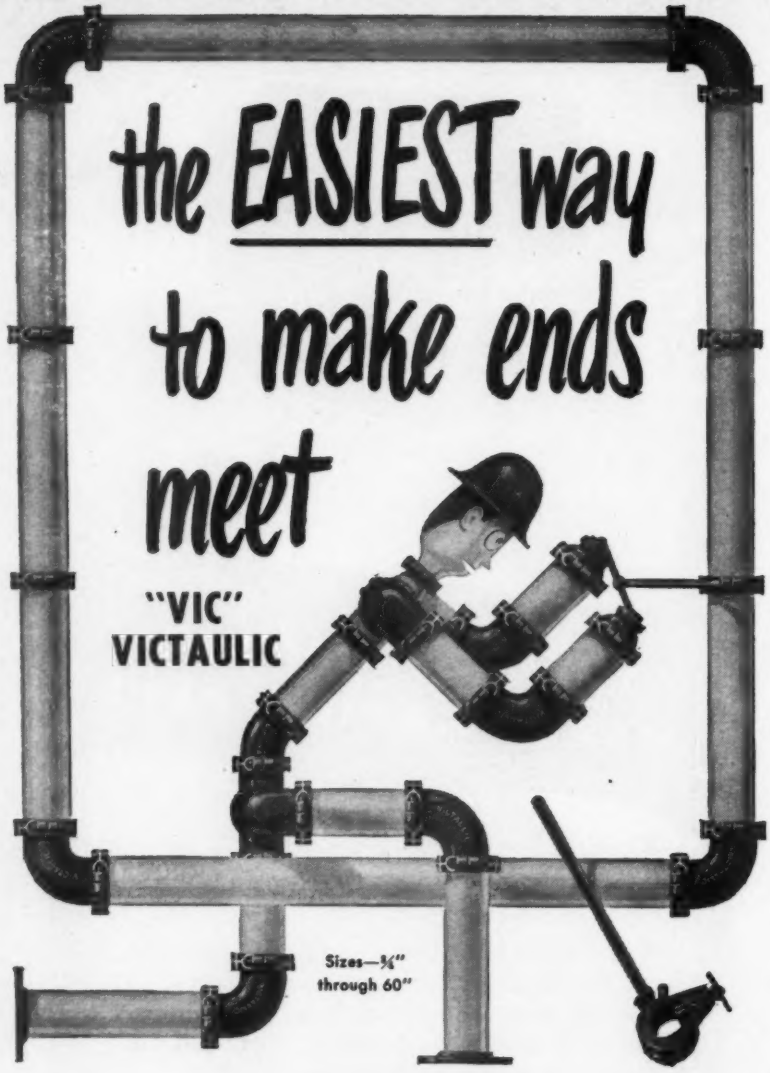

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You save every way when you *join up* with "Vic"– a simple two-bolt design gives quick, easy hookups, a standard T-Wrench is the only tool needed for connections... joints are positive-locked, leak-proof, will stand up under extreme pressure, vacuum, or strain conditions.

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26TH VICTAULIC YEAR

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VICTAULIC
PIPE COUPLINGS AND FITTINGS

portant that the barge be kept electrically insulated from the platform for safety reasons as well as to avoid the heavy load on the protective system which would be presented by the unpolarized hull of the barge.

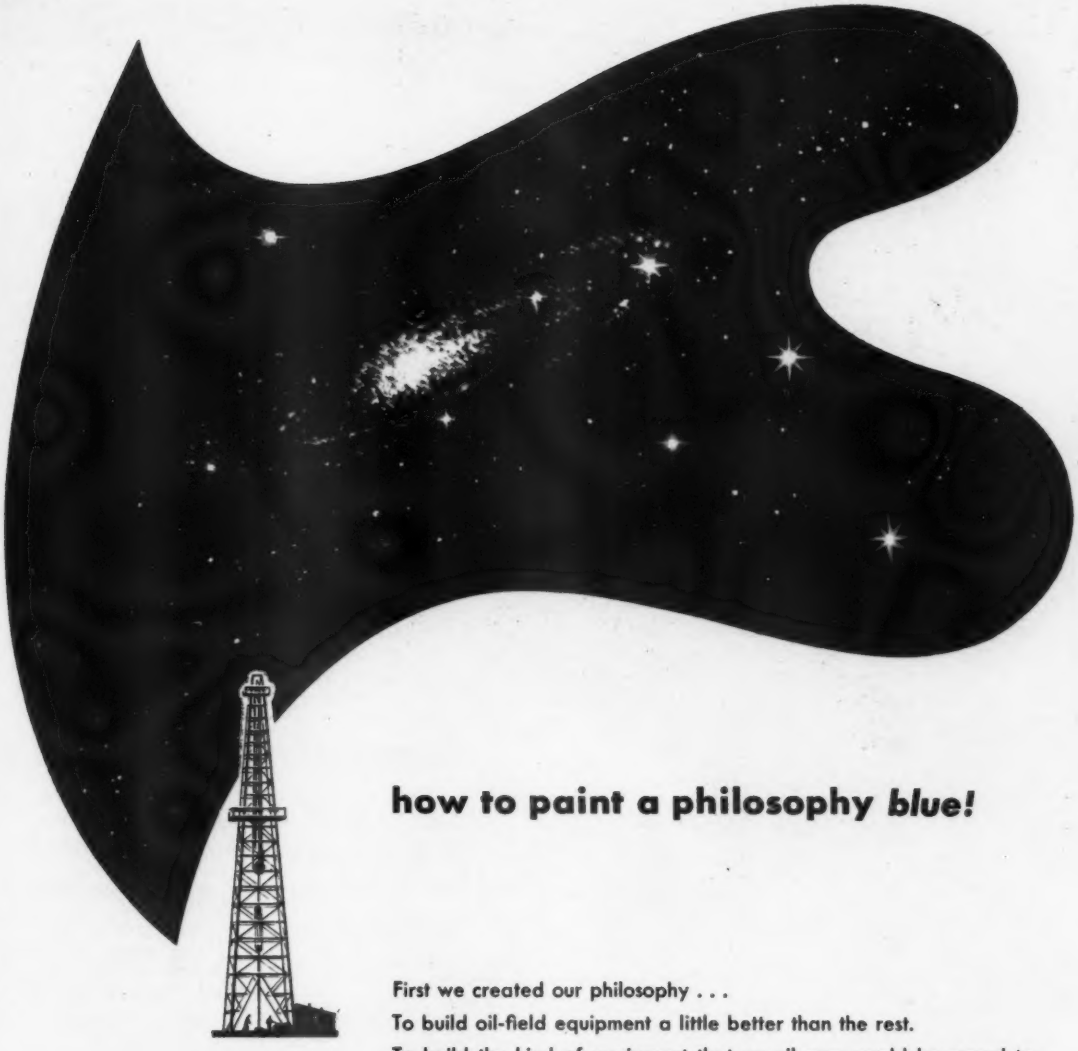
With complete reliance on cathodic protection, one large offshore operator now uses no protective coating whatever on the submerged portions of new platform jackets, with good economic justification. The annual cost per square foot for cathodic protection of an average size platform amounts to as little as 5 or 6 cents for the first 2-year installation, including polarization costs. Due to decreasing current requirements with time and the elimination of polarization costs in subsequent replacements, average costs may well fall to as little as 4 cents per square foot per year over an extended period of time.

Another innovation by the same operator referred to above is to incorporate anode string supports into jacket design, and in certain instances the anode strings are actually installed on the jacket on shore. A view of anodes so installed is presented in Fig. 5. They are tied to their supports with soft line and are not lowered to proper level until the jacket is in position and all piling and conductor pipes are driven, at which time the necessary ribbon is also installed.

In certain instances corrosion test specimens have been suspended from protected platforms, and the test data obtained to date have fully substantiated the effectiveness of cathodic protection in mitigating corrosion on the submerged platform surfaces under actual offshore conditions.

Although the foregoing discussion has been limited to offshore drilling platforms and associated drilling tenders and pipe lines, cathodic protection is equally applicable to other steel structures subjected to salt-water corrosion. Sheet-steel bulkheads, piers, drilling barges, and moving barges have all been protected cathodically. Other marine applications of particular interest to the petroleum industry are well-head protection, including the protective steel cages around same, in marshland and bay producing fields, and the associated flow and gathering lines.

There appears to be little doubt that cathodic protection will eventually be accepted by all offshore operators as an invaluable ally in their unceasing fight against corrosion. While magnesium-anode systems are at present the only practical means of such protection, as offshore producing fields grow in size it is quite likely that some of these will eventually be electrified. In such case, should alternating current of reasonable cost become available, serious consideration will have to be given to the economics of using rectifiers in conjunction with graphite anodes as source of protective currents on offshore platforms.



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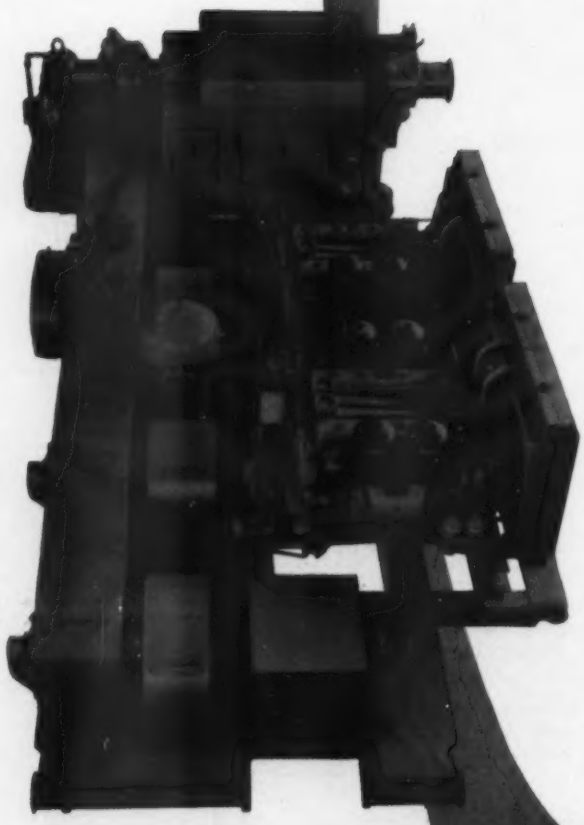

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GULF COAST REFINERS.—They are carefully studying all manufacturing developments, as seen in this photo of Humble's Baytown foremen, department heads, and refinery officials. Session is on cost-control progress.

Humble's

COST CONTROL PROGRAM

Uncovers many economies which better planning can bring about—

HOW CAN REFINERY OPERATING COSTS BE REDUCED?

EIGHTEEN foremen and assistant foremen of Humble Oil & Refining Co.'s Baytown, Tex., refinery helped to answer this question at a recent special meeting. The men reviewed the results of a 3-year cost control program carried on by the plant's mechanical department.

Plants manager Gordon L. Farned keynoted the meeting with a brief review of Humble's company-wide program. He first reviewed the postwar period of expansion and heavy capital investments, then cited the following decrease in nation-wide oil production, pointing out that this reduction was borne primarily by Texas. This substantially decreased Humble's production with resulting effect on pipe-line deliveries and refinery runs. Farned concluded by telling his men: "In the final analysis, you are in the best position to control costs by reviewing your operations critically, and planning carefully within your own department, as well as coordinating your work with other departments."

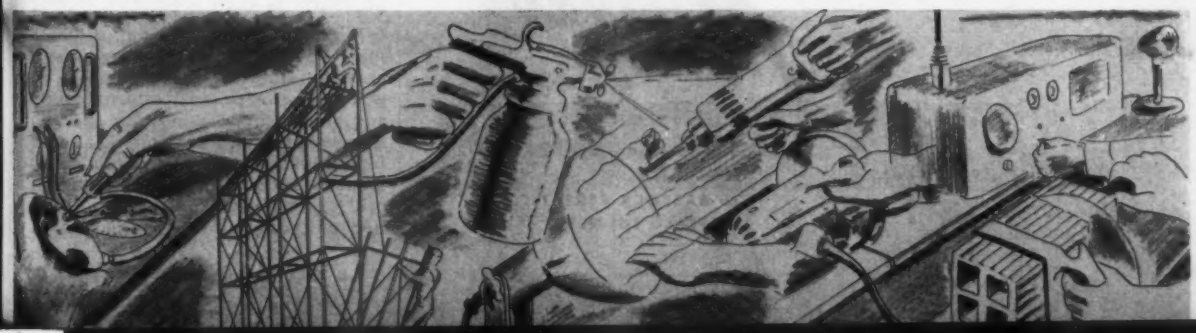
GORDON L. FARNED

Following the plants manager, the 18 refinery foremen presented their progress reports on cost reduction. Here is a department-by-department listing of their reports:

Instrument.—Foreman W. H. Fortney reviewed substantial savings in instrument-department operating costs obtained through additional shop equipment and improved maintenance technique. Special attention has been given to better coordination of instrument field work and routine maintenance, with a view to increasing efficiency and reducing costs.

Future plans are to include greater use of automatic control and analyzing instruments on more operating units.

Lead burner.—Foreman F. A. Ferguson, lead burner department, reported the use of mobile handling equipment as a major cost reduction



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method which has eliminated handling heavy material manually. At the same time, expanded work requirements have been met without increasing personnel. Careful job planning, he said, has eliminated nonproductive time, and better job performance has resulted.

Carpenter.—Jigs suggested and made by shop carpenters, replacement of shop equipment with modern machines, plus greater use of portable electric equipment were among many cost-control items reported by Carpenter Foreman J. E. Seale. Increased use of mobile handling machines for transporting heavy materials has effected substantial savings.

The experimental use of light metal, sectional scaffolds was reported as satisfactory. "We expect to use this type of scaffold more extensively in the future," Seale concluded.

Painting operations. — On - the - job training program improved the quality of work performed by painters, Foreman Jerry Ulch said in his resume of cost-control progress. Greater use of mechanical painting equipment for buffing metal and spraying paint has brought substantial savings and improved efficiency of field work. Vapor honing machines, improved painting technique on automotive vehicles, and painting pipe for overhead lines prior to erection were among numerous other improvements and cost-reduction methods reported by Ulch. Future plans include the use of mechanical furniture sanders and infrared lamp banks to reduce drying time from hours to minutes.

Tools and equipment. — Modern tools, plus supervised training on the job and in classroom have increased efficient performance of work with tools, Foreman T. J. Gillam, tool and equipment, reported. At the same time, he said, repair costs on new tools are practically nothing as compared with maintenance and repair costs on old tools which are being replaced with more modern equipment as often as is practicable.

Very substantial savings are realized from the use of portable toolroom trailers for turnaround jobs, tungsten carbine tips on tube-cleaning drills, impact wrenches, and pneumatic spike driver and tie tampers for railroad maintenance crews. Future plans include completely equipped tool rooms located at key points, to reduce time to a minimum and provide service simultaneously to all crafts in each area.

Welding.—Centralization of welding operations at the new mechanical shop building in larger quarters, and installation of more modern handling equipment saved money for the welding department, Foreman G. L. Bradford reported. A new circle-cutting machine, additional welding positioners, larger metallizing gun, and adoption of propane for burning and cut-

ting were listed among numerous cost-reduction items.

Bradford reported also that the use of bulk oxygen distribution systems on certain units, as well as in the shop, had resulted in big savings. He announced plans for using eutectic rods for cast-iron welding, and automatic welding processes among future improvements.

Brickmasons.—"In the brickmason department, job planning has increased efficiency and reduced lost time more than any other factor," Foreman J. E. Boydell reported.

He also stated that big savings were effected with brick and tile-cutting saws.

"Use of a drag line to raise material instead of ropes and pulleys has reduced some jobs to half the time formerly required," he concluded.

Piping department. — Pipe Department Foreman J. F. (Blondie) Heintschel cited big savings with the use of new pipe-bending machines which bend pipe, without heating, up to 12 in. in diameter. He reviewed savings wrought by new drilling machines for installing pipe under roads and through tank fire walls. Better supervision on turnaround jobs and field work, plus a new and effective method of detailing pipe work, were listed among further successful cost-reduction techniques.

The current job-training program will be continued, as it had already increased general efficiency of the department. Among future plans, Heintschel cited a better method of reporting time, and an improved system of stocking materials for plant plumbing requirements.

Insulation.—Changing from molded asbestos to asbestos sponge felt has proved a big savings factor in reducing insulation department costs, Foreman F. E. Kelly said. Improved technique of insulating lines to identify connections reduced loss of asbestos, too, he reported. New table saws, asphalt-heating kettle, and cork-dipping pan have reduced installation time and costs materially, as well as improving the workmanship of the craft.

Included in future plans for further improvement are a microseal insulation weatherproofing applied by spray machines, and aluminum-foil-backed felt roofing, both of which Kelly said had proved satisfactory, experimentally.

Sheet metal.—Foreman W. J. Moore outlined gratifying progress in the sheet metal department's cost-control efforts, which he said had been realized largely with new, more modern shop machinery. The versatility of these machines, he said, has taken the tedious, heavy work off the men, and permits them to perform better work in less time.

A job-training program has improved the quality of workmanship, and has provided also a more uniform method of instruction. He stated that future savings would undoubtedly be realized from new machines recently installed in the shop.

Electric.—Assistant Foreman J. M. Bryan reported the greatest progress in the electric department had been made in the field of planning and coordination.

"The use of two-way radio communication is largely responsible for this improvement," he said.

Numerous cases were cited of new and improved methods of handling field work, combating corrosion, and making replacements of various types of electrical equipment. Another interesting highlight was his report on experiments with new, improved equipment and supplies, including a new type of insulation resistant to practically all chemicals. Coordination of departmental work with others was substantially improved with the utilization of a field engineer, he said.

Blacksmiths. — Foreman Ed Good outlined radical improvements in blacksmith work, which he said had resulted in a high degree of efficiency, achieved principally by reorganizing and dividing the light and heavy work in order that it can be per-

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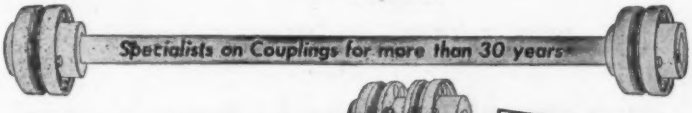

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Thomas Couplings have a wide range of speeds, horsepower and shaft sizes:
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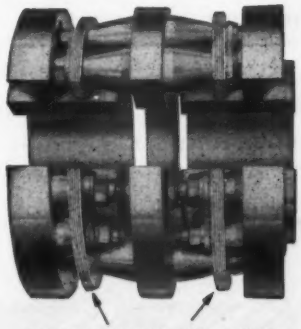

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formed easier and better. This is true, also, with the use of trip and steam hammers, as well as a bar cutter.

Boilermakers. — Gratifying savings with new, improved shop equipment were reviewed by Boilermaker Foreman J. H. Massey. He mentioned machines that take heavy work off the men and permit them to perform better quality of work—machines like the new angle roll, two new flange shop presses, a 16-ft. plate roll, and metal-cutting band saw.

Rigging.—Impressive cost-reduction figures were cited by Foreman V. R. Reese in the rigging department, where a considerable number of heavy mobile lifting and carrying machines have been put into operation. Wider use of this heavy equipment throughout the plant has taken the heavy work off other crafts, as well as the riggers, and has increased efficiency, likewise, in all mechanical departments served by this rigging equipment. This heavy-duty mobile equipment includes large and small cranes, draglines, backfillers, straddle machines, bulldozers, and hydro cranes.

Two-way radio equipment on the mobile units has added substantially to the savings realized in the rigging department.

Machinists.—Foreman A. F. Grodhaus cited improvements made since the machinists department has occupied larger, more convenient quarters in the new shop building. The largest savings, he said, have been achieved in a careful study and use of new, improved metals and parts for equipment throughout the plant which give longer service and have lightened the burden of the machinists on maintenance. In turn, he said, this permits the machinists to devote more time to performing essential work at a higher degree of efficiency.

Several current projects were reviewed which have already effected substantial savings, such as determining interchangeability of spare parts in order to make full use of parts stocked, and keep storehouse stock at a minimum. He discussed current success with chrome plating piston rods, and plans for expanding this service.

Listed in future plans were improved maintenance cost reports on each pump, turbine, and compressor to permit closer control of costs; new types of materials for valve disks now being used experimentally; and preventive-maintenance measures which will reduce the amount of emergency work required of machinists.

Garage. — Time-savings equipment which takes heavy work off the men was reported by J. F. Shepherd, acting garage foreman. He cited the successful use of tire changers, impact wrenches, and a new testing machine which removes guess work with engine repairs, conserves parts, and reduces repair time. A new battery charger cuts charging time in half.

Shepherd reported remodeling the interior of the garage, now under way, which will provide more room to handle increasing amount of work. Future plans include a new hydraulic lift to eliminate hand jacks and stands.

Reclamation.—Improved method of performing work proved the largest single contributing factor to reclamation department's cost control progress, Foreman Harley Yawn reported. He cited substantial savings on plug valves with installation of special lubricant fittings, and more suitable lubricant fittings and more suitable lubricants. A modern bolt-threading machine replaced two obsolete machines, two jib cranes for handling stock materials, shop-made facing machines, and a lapping machine were among other major savings items.

Future plans will add another plug valve lapping machine, and a 6-ft. radial drill to shop equipment. "We expect to palletize all stock materials for speedier and better handling," Yawn concluded.

Labor.—Foreman Ben S. Love, labor department, closed the reviews with his report of progress principally in improved methods of performing work, aided by certain types of mechanical equipment, radio communications, more and better hand tools, and faster transportation for supervisors and men.

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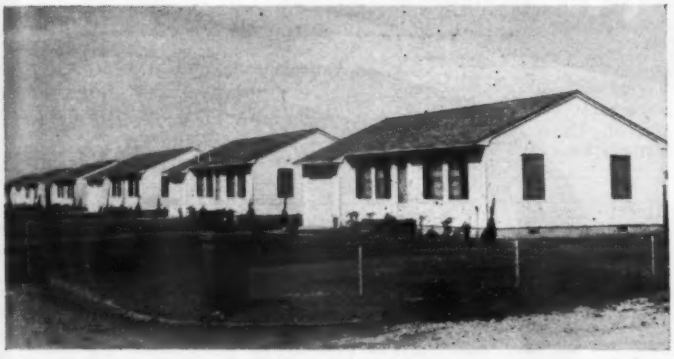

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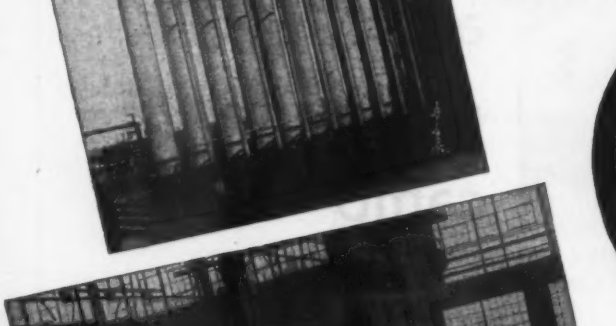

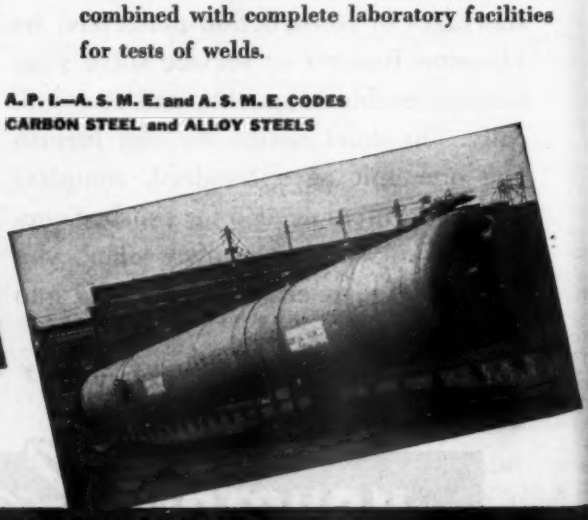

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Joe's Lake Field Pioneers

SECONDARY-RECOVERY METHODS

in Eocene Wilcox Sands

by J. M. Penrod

JOE'S LAKE field, the Gulf Coast's first major Wilcox discovery, has been subjected to pressure maintenance by gas injection and at the present time is under a program of water injection in an attempt to recover the maximum amount of oil and gas. The data at hand indicate that both the gas injection and water-flood program have been successful thus far in carrying this reserve to full maximum recovery.

The joint owners of the field, American Republics Corp. and Houston Oil Co. of Texas, being interested in good conservation practice and cognizant of sound engineering fundamentals, have pioneered Eocene Wilcox sand development by instituting the first major pressure maintenance by gas injection program and the first water-flood project in this geologic strata.

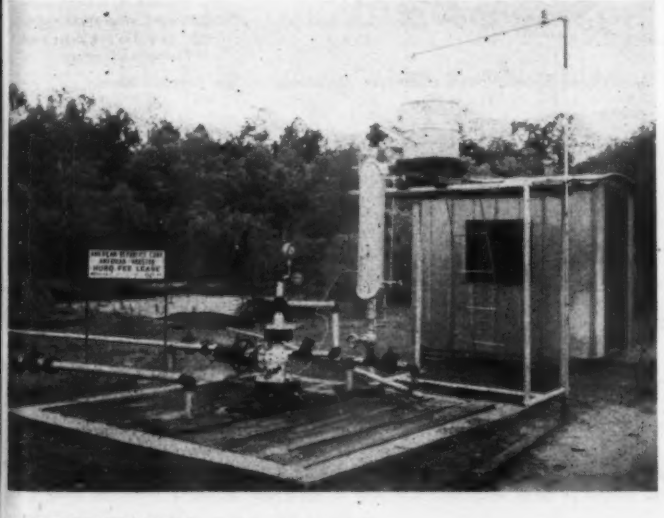
The water-flood program, now under way in both "First" and "Second" sands, does not have enough background fully to be evaluated. However, it appears to have been successful thus far and considerable significance is placed on the apparent success of water flooding in this formation where gas injection had preceded flooding; where permeability distribution ranges from fair to poor; and where other conditions were not ideal for water-flood operations.

J. M. Penrod is a reservoir engineer in the home office of American Republics Corp. in Houston. His interest in water flooding began during 9 years of work for Core Laboratories, Inc. He joined that organization in 1938 after receiving his education in Dallas. During his tenure with Core Lab he spent 2 years in Illinois as district engineer. A good part of his work in the Illinois area was in connection with water flooding. At the time Penrod joined American Republics in 1947, he was district engineer for Core Lab in Houston. He was employed by the company during the initial stages of the Joe's Lake water flood which is described in the accompanying article. Penrod remained at Joe's Lake, in active charge of the flood program, until January of this year when he was called into the home office in his present capacity.

Location and Development of Field

American Republics Corp. and Houston Oil Co. of Texas discovered Joe's Lake field when their 2 Norman Hurd well was completed May 2, 1937. Completion was made in open hole from 7,621-41 ft. in First sand. On potential test, the well made 463 bbl. of oil on ¼-in. choke, casing pressure 1,600 psi., tubing pressure 1,100 psi., gas-oil ratio 1,715 to 1, and gravity 47° A.P.I.

Located in Tyler County, Texas, on mineral fee lands, the Joe's Lake Wilcox structure is an anticlinal fold bordered on the north by an east-west trending down-to-the-coast fault having a displacement of approximately 500 ft. On the south side of the field a second east-west trending fault occurs approximately 8,000 ft. south of and parallel to the north boundary fault. This second fault has a displacement of about 250 ft. on the west end of the field, but decreases in throw to the east and dies out before the east end of the field is reached. Within the producing limits of the



Salt water supply well. Production is 4,000 bbl. per day from Frio sand; chemical house in background.

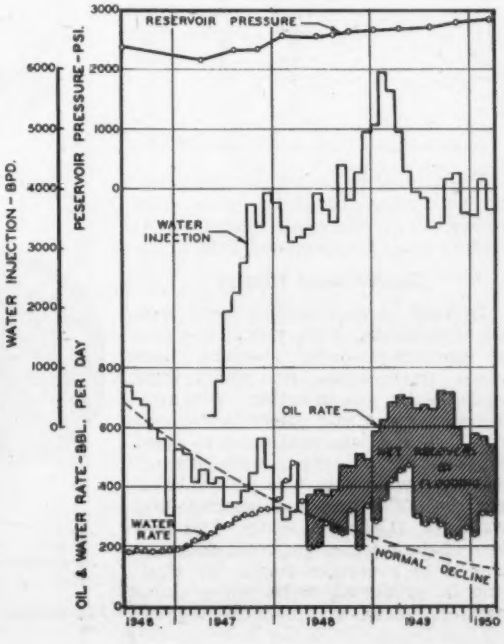


Fig. 1—Production-history chart for "Second Sand" reservoir. Note increased oil production and reservoir pressure due to water injection.

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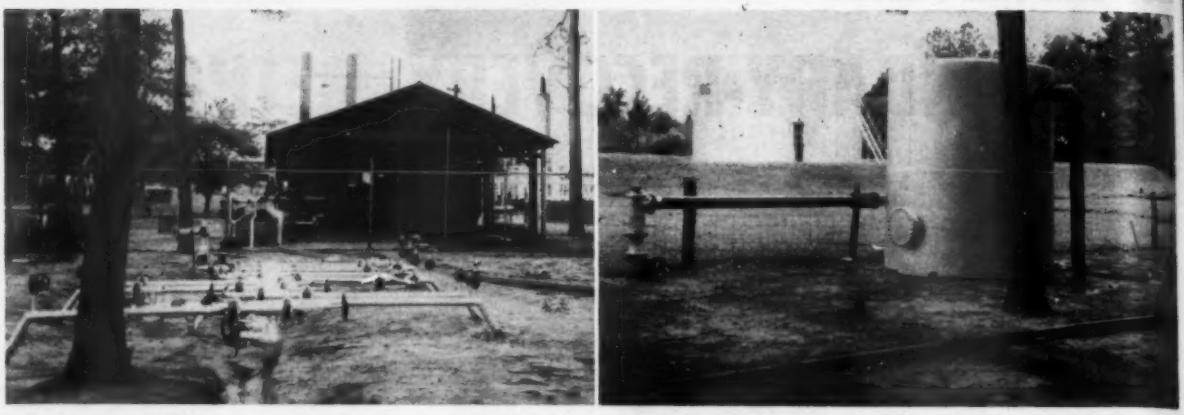

Left: Injection manifold for the salt-water injection system, with pumping station in background. Right: This 100-bbl. welded steel tank has been converted to a salt-water filter, using a media of excelsior.

structure, no faulting of the producing horizons is noticed.

Immediately after bringing in the discovery well, a development program (on 20-acre spacing) was launched and was continuous for the next 4 years. The third completion, 4 Hurd, failed in the regular First sand, so it was deepened 47 ft. and was completed September 10, 1937, in Second sand to establish a new pay zone. Completion was made through perforations in 5-in. o.d. liner 7,700-04 ft., and was potentialed at 525 bbl. of oil on ¼-in. choke. Casing pressure was 1,000 psi., tubing pressure 1,025 psi., gas-oil ratio 1,040 to 1, and gravity 43.3° A.P.I.

Table 1 shows the development by years of the First and Second sand reservoirs.

TABLE 1—NUMBER OF WELLS COMPLETED DURING YEAR

Year	First sand	Second sand	Dry holes
1937	2	3	0
1938	2	6	0
1939	3	10	1
1940	2	17	1
1941	0	2	2
Totals	9	38	4

The tabulation shows that the greater percentage of wells were completed in Second sand; therefore, its history shall be discussed first.

Second-Sand History

In 1940, it was evident from pressure-production history that this was a solution-gas-drive reservoir, and plans were made for maintaining pressure by gas injection. This program was put into effect in November 1940 and was continued to April 1, 1948, during which time average daily injection rate was 5.25 M.M.c.f. per day. The gas was injected into wells 35, 31, and 16 Hurd. The pattern of the injected gas front was controlled to a certain degree by shutting in producing wells when ratios became excessive and by moving the

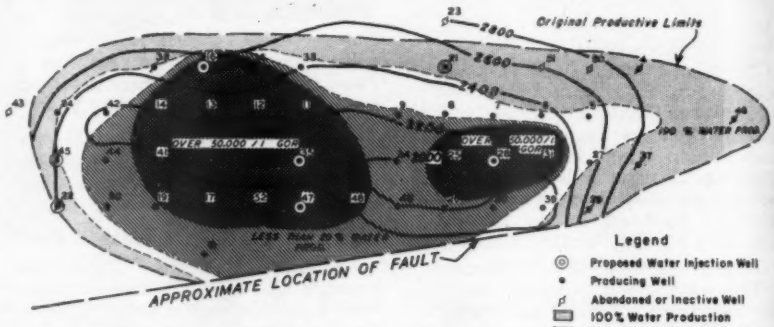

Fig. 2—Second sand reservoir conditions at the time water-flooding operations began. Joe's Lake field, Tyler County, Texas (Norman Hurd lease of American Republics Corp.-Houston Oil Co., mineral fee lands).

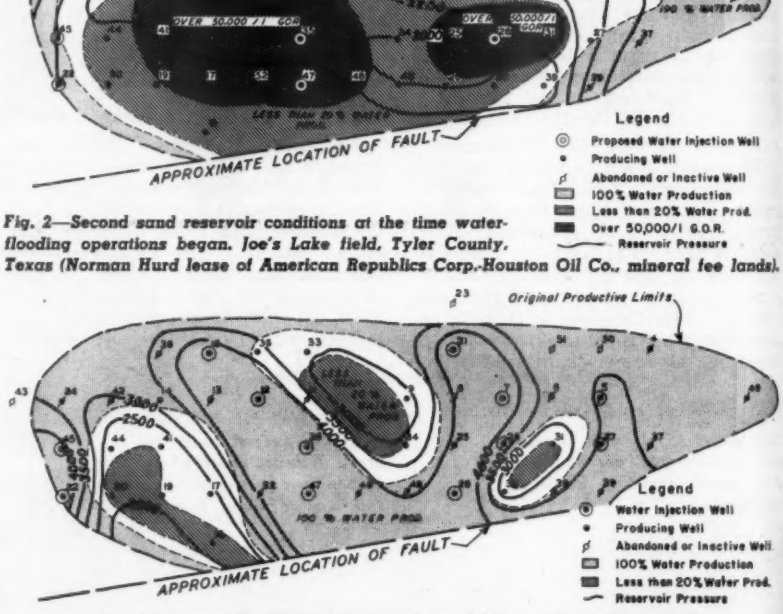

Fig. 3—Map of Second sand reservoir conditions at the present time.

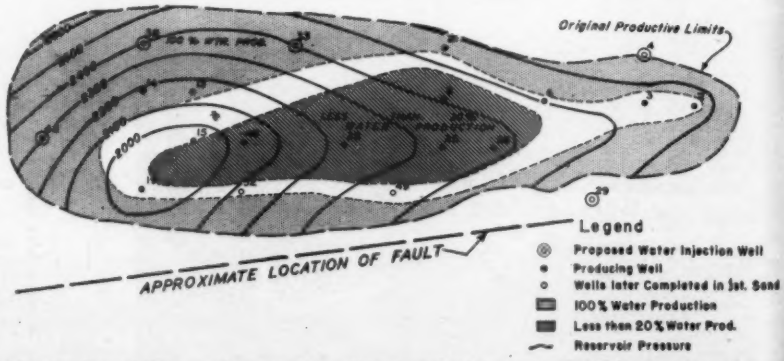

Fig. 4—Map of First sand reservoir conditions at the time water-flooding operations began.

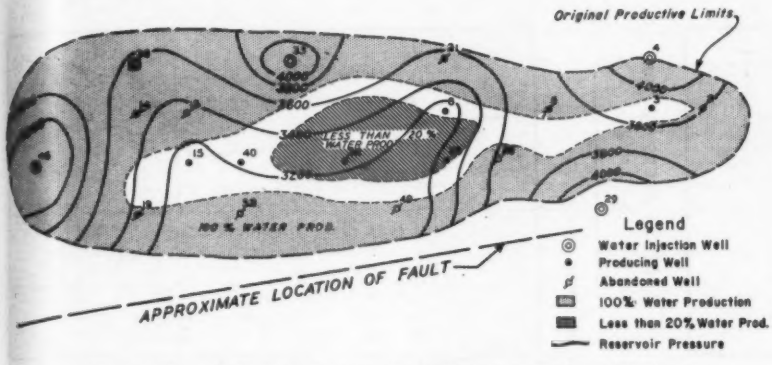

Fig. 5—Map of First sand reservoir conditions at the present time.

location of the injection well. Since the gas was not being flared, wells were produced to a relatively high ratio.

In early 1947, daily production had declined to approximately 420 bbl. per day (see Fig. 1); the injected gas had covered a large portion of the reservoir (see Fig. 2), and the weighted average gas-oil ratio was approximately 9,000 cu. ft. per barrel. A detailed study of the reservoir was made using all available data (see Table 2) including reservoir fluid analysis and core analysis, relative-permeability measurements, connate-water content by restored state method, and the effects of permeability distribution upon reservoir behavior. As a result of the study, a water-flood program was inaugurated in May 1947 by starting injection into 35 Hurd well. Fig. 2 shows the approximate location of the free gas concentration, the edgewater encroachment, and isobaric conditions at the time flooding operations began.

The pattern for locating injection wells (see Fig. 2) was chosen after considerable study and calculation. It was decided that since the center portion of the field had very high gas saturation (see Fig. 2) the recovery of oil would be greater by injecting water into this area first and adding the flank wells later in the life of the flood. Wells 35, 47, and 28 Hurd were put on in the order named as injection wells.

The first effect of the water-injection program on oil production was noticed in July 1948, which was 14 months from date of first water injection and at which time 1,195,000 bbl. of water had been injected. It should be mentioned at this point that some 900,000 bbl. of the 1,195,000 were injected into the gassed-out areas of the field, thus partially explaining the long interval before first kick in oil production.

TABLE 2—BASIC RESERVOIR DATA

First Sand	
Average permeability, md.	100
Average porosity, per cent	22.6
Average connate water, per cent	37.0
Average residual-oil saturation in cores, per cent	7.0
Original bottom-hole pressure, psig.	3,520
Original solution gas-oil ratio, cu. ft. per bbl.	1,070
Original formation-volume factor	1.835
Saturation pressure of reservoir crude, psig.	3,520
Viscosity of reservoir crude at sat. press., cp.	0.257
Bottom-hole temperature, °F.	212
Second Sand	
Average permeability, md.	171
Average porosity, per cent	22.8
Average connate water, per cent	42.0
Average residual-oil saturation in cores, per cent	8.0
Original bottom-hole pressure, psig.	3,555
Original solution-gas-oil ratio, cu. ft. per bbl.	1,070
Original formation-volume factor	1.835
Saturation pressure of reservoir crude, psig.	3,555
Viscosity of reservoir crude at sat. press., cp.	0.257
Bottom-hole temperature, °F.	214

The production-history graph shows the behavior of the reservoir as a whole. However, as can be seen by Fig. 3, there are three distinct segments of the reservoir and the behavior is not the same for each remaining productive area. This is best shown by Fig. 3, which shows isobaric conditions at the present time. The pressure gradients observed across the reservoir are considerably higher than anticipated and are attributed to the high percentage of gas saturation in the pores causing low permeability to the mobile fluids.

It is evident from the above that controlling Second-sand reservoir performance involves the observation of the three segments. This is done by quarterly bottom-hole-pressure measurements, and continuous well tests to show movement of the oil and water fronts. Changes in water-injection rates and the location of water-injection wells are governed by the performance of the producing wells affected.

Additional oil recovery that may be credited to water-flood operations totals 246,000 bbl. to April 1, 1950; cumulative water injection to April 1, 1950, is 3,878,000 bbl. The large volume of free gas in the reservoir is being withdrawn slowly so as to prevent waste and the produced gas-oil ratio is now approaching solution ratio.

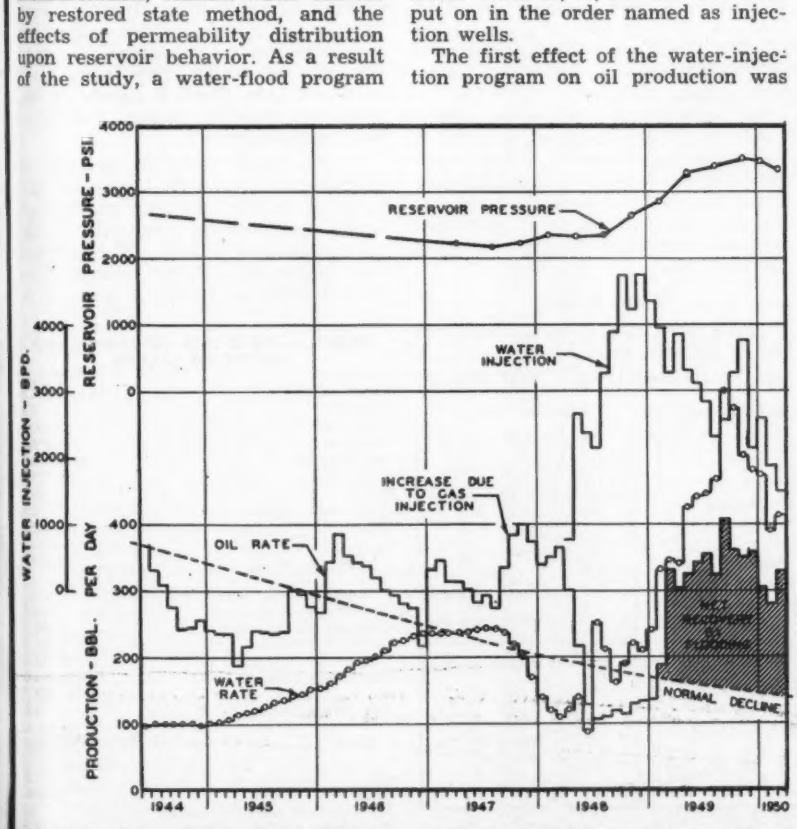

Fig. 6—Production-history chart for First sand reservoir. Note increasing oil production and reservoir pressure due first to gas injection and later to water injection.

First-Sand History

The development of the First-sand reservoir was on an irregular spac-

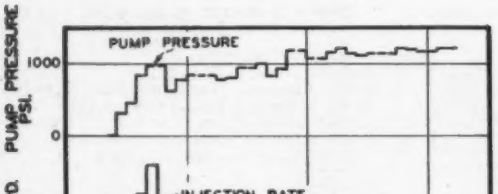

Fig. 7—Water injection data for well 35 N. Hurt.

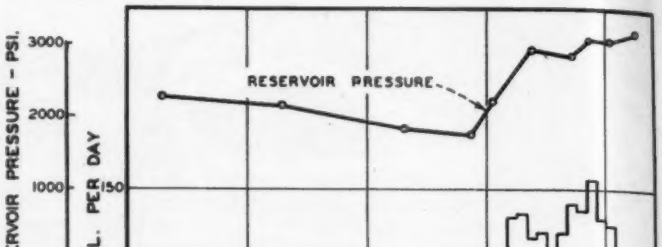

Fig. 8—Production data for well 34 N. Hurd.

ing pattern. During the period from May 1937 to August 1947, the zone was produced by natural means during which time reservoir pressure dropped from an original of 3,520 to 2,175 psi. The pressure production history revealed that there was some water encroachment, but that it was not sufficient to maintain pressure at the desired rate of withdrawal.

During the period August 1947 through March 1948, gas was injected into First sand via 14 Hurd well. This was done on an experimental basis during which time an engineering study was being made as to the feasibility of entering into a gas-injection or water-flood program. The results of the study favored water flooding over gas injection. Fig. 4 shows the approximate location of edgewater encroachment, isobaric conditions, and the remaining oil and gas to be produced at the time flooding operations began (April 1948).

The flank injection pattern (see Fig. 4) was selected for this reservoir. First significant kick in oil production was noted in February 1949, at which time 1,106,000 bbl. of water had been injected. Fig. 5 shows the present location of water fronts and isobaric conditions.

Since this sand had not been fully developed, it was necessary to start a workover program to give better drainage. In this connection, wells 8 and 25 Hurd were completed for flowing oil wells. Wells 28 and 49 Hurd were recompleted in this sand but were found to be watered out. Other wells are to be completed in this sand when they have watered out in Second sand.

The production-history graph, Fig. 6, shows reservoir performance from 1944 to April 1950. The control of reservoir performance during the life of the water flood has been handled by observing bottom-hole-pressure data (measured quarterly) and keeping close tab on the location of water front from accurate well-test data. For example, it was noted that water percentage at wells 15 and 40 was increasing very rapidly and the oil percentage was decreasing in the same order of magnitude. Water injection was discontinued into No. 38, resulting in an immediate change in wells 15 and 40 to more oil and less water production.

Bottom-hole pressure was built up in First sand to a maximum of 3,490 psi. in November 1949. This was slightly higher than desired, so injection rate was reduced to allow pressure to drop. When pressure has reached the desired point, withdrawal and injection rates will be balanced to maintain pressure.

Oil production credited to water-flood operations to April 1, 1950, is 74,000 bbl. Cumulative water injection to the same date is 2,289,000 bbl. Since only a small amount of gas was injected into this sand, the produced ratio has remained at approximately solution ratio.

Water Supply

Three wells in the field, which did not fit into the flood program (11, 13, and 50 Norman Hurd) were recompleted as salt-water-producing wells. Wells 11 and 50 Hurd were completed in the Cockfield sand at approximately 4,900 ft. and 13 Hurd was completed in Frio sand at approximately 3,300 ft. Water is produced by gas-lift method, using casing-flow differential-type valves. After passing through a separator, the water is stored in two 11,000-bbl. storage tanks. All water produced with the oil is utilized for reinjection. Gravity forces the water through a filter containing excelsior and on to pumps. Average pressure on suction line is approximately 5 psig. Table 3 shows an analysis of injection water just after leaving the filter.

It was noted early in the life of flooding operations that interior surfaces of water lines, separator, and tanks were coating over with a calcium carbonate deposit. A treatment was begun by use of sodium hexametaphosphate (about 5 p.p.m.) to

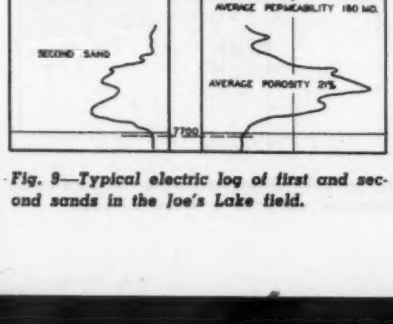

Fig. 9—Typical electric log of first and second sands in the Joe's Lake field.

TABLE 3—ANALYSIS OF JOE'S LAKE INJECTION WATER

Ions—	P.p.m.
Bicarbonates	275.0
Sulfates	0.0
Chlorides	36,360.0
Calcium	1,972.0
Magnesium	368.0
Sodium	20,712.0
Silica	24.0
Aluminum oxide	2.0
Iron	22.0
Total	59,733.0
Hypothetically combined—	**P.p.m.**
Iron bicarbonate	70.0
Calcium bicarbonate	301.0
Calcium chloride	5,257.0
Magnesium chloride	1,433.0
Sodium chloride	52,646.0
Silica	24.0
Aluminum oxide	2.0
Total	59,733.0
pH	7.2
Dissolved oxygen	None
Free carbon dioxide, p.p.m.	16
Hydrogen sulfide, p.p.m.	4.4
Specific gravity at 60° F.	1.043
Turbidity, p.p.m.	5

stabilize the calcium carbonate supersaturation. The precipitation was halted immediately and within a few weeks it was noted that old scale was being removed from separator and tank interiors.

The system is a closed one by using an oil seal on the storage tanks.

Injection System

The selection of an injection well was made on the basis of its structural location and sand conditions. In some cases it was necessary to recomplete from one sand to another, or to perforate additional section. In all cases the old wells were utilized and there has been no additional drilling. For the most part, tubing has been pulled and used elsewhere since it is not needed in injection wells.

The injection system consists of four power pumps discharging into two manifolds. Manifold pressures are maintained at 900 and 1,200 psi.

There has been some plugging action on the sand face of injection wells throughout the life of the flood. This has been overcome by periodical backwashing of the wells and an occasional acid treatment of 500 gal. of 50/50 mud acid. Fig. 7 shows behavior of a typical injection well.

Water meters have been used on each well to measure the injected volumes. A 2,000-psi. working pressure velocity-type meter, having a propeller in the moving stream and utilizing a magnetic coupling between propeller parts and the register, eliminating stuffing boxes, etc., has given satisfactory service.

Most First and Second sand wells flowed until water percentage increased to 20 per cent or more. Gas lift is used when wells cease to flow. Because of low permeability and low well productivity indices, it is difficult to produce large volume of fluid from the wells when water percentage is high. However, production is maintained to approximately 97 per cent water cut before reaching economic limit. Fig. 8 shows the performance history of an average oil-producing well.

During the period when oil rates were beginning to show considerable increases as a result of water injection, it was apparent that certain wells should be produced to capacity and that others should be held back until they were affected. A new producing schedule was worked out using a field-allowable basis instead of a per well basis. This has been a most important factor in controlling the reservoir performance.

Individual well tests are made monthly, and bottom-hole-pressure survey is taken quarterly. Withdrawal volumes of oil, gas, and water are converted to barrels and compared with the injected volume in barrels at the end of each month. It has been found that liquid meters with automatic samplers are very useful in testing low-volume wells where accurate water-cut percentages must be determined. All records are compiled at the field office under the direct supervision of field engineer and superintendent.

Acknowledgments

Acknowledgment is made to the Texas Railroad Commission, which has been most helpful in carrying out the water-flood program in Joe's Lake field. As a result of the hearing held before the commission, permission was granted to change the allowable from a per well basis to a field basis. This has permitted the operator to control production so as to obtain the very best reservoir performance.

The Texas Railroad Commission has always been interested in true conservation and we think this is a typical example of the interest that the commission shows in any worth-while project and demonstrates the fact that it will do everything possible to help an operator to conserve the natural resources of Texas.

The writer wishes to thank the management of American Republics Corp. and Houston Oil Co. of Texas for permission to publish the performance history of Joe's Lake field. Acknowledgment is also made for the work done by the consulting firms of Core Laboratories, Inc., and James A. Lewis Engineering, whose work furnished the basis for the secondary-recovery operations in this field. The history of Joe's Lake field could not have been written without the assistance of J. P. Black, G. S. Reardon, H. L. Miers, R. F. Sawyer, L. B. Howard, H. H. Morgan, and N. F. Gulledge, who were instrumental in developing the field and compiling the early data on the reservoir performance. The assistance of petroleum engineers John S. Floeter and C. A. Shaid in assembling data is greatly appreciated.

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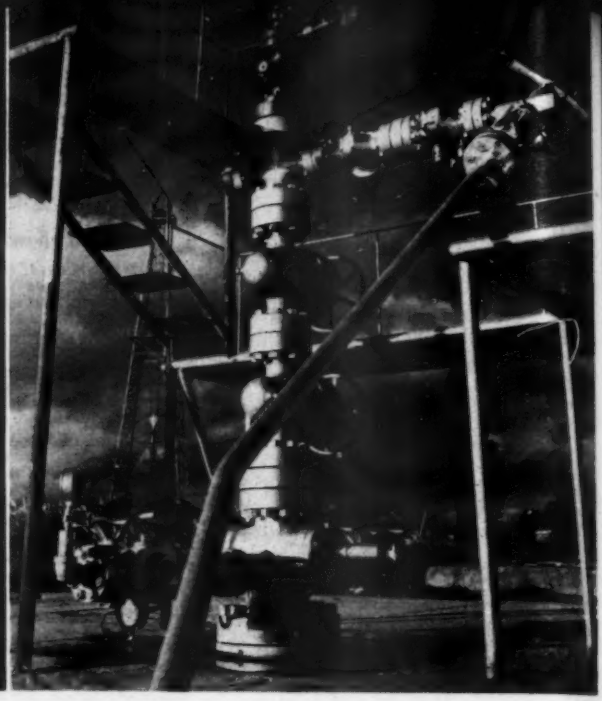

SHINING EXAMPLES.—These spectacular views show two rather particular specialties of the Gulf Coast: (1) offshore drilling, and (2) high-pressure wells. But there are many more special phases, also: huge gas reserves to feed the big-inch pipe lines to the east; mammoth oil refineries (31 per cent of nation's total); a new and thriving petrochemical industry; oil-tool and equipment manufacturing; many, many more.

112 Wells Drilled Below 12,000 Ft. In Gulf Coast Area in 1949

by Lucy Dee Owen

THERE were 112 wells drilled below 12,000 ft. in the Gulf Coast area during 1949—a slight decrease from the all-time high of 1948 when 126 such wells were put down (see Table 1). Although not currently holding the record for either the deepest hole drilled or the deepest producer in the United States, the area remains the leader in scope of deep drilling.

Humble Oil & Refining Co. established a new producing-depth record during 1949 for the Gulf Coast area with a deep wildcat in Louisiana (see Table 2). Humble 1 State Lease 1452 in Lafourche Parish opened up Lake Raccourci field in October and set the new record with gas-condensate production from 14,434 ft. Prior to Humble's discovery, Shell Oil Co. had long held the producing-depth record with various wells in its Weeks Island field of Iberia Parish, Louisiana.

Deepest well during the past year was drilled by Shell in Weeks Island field. The company's 1 Weeks-Gall State Unit 1 penetrated to a total depth of 15,913 ft. before being completed as an oil producer at 14,150 ft. Second-place honors go to Humble

This report is a special record maintained continuously by the Journal's Houston editorial office, here summarized for this Annual Gulf Coast Issue. It contains a great deal of "record" information of interest to drilling and production men.

for its 2 J. R. Williams, a wildcat in Washington County, Alabama. This test went to 15,659 ft., and established a new depth record for Alabama, before being abandoned in February.

The great majority of the deep wells continue to be drilled in the Louisiana coastal region. The Pelican State was the scene of 93 of the 112 deep tests drilled throughout the year (see Table 3). This compared with 18 for the Texas Gulf Coast area, and 1 for Alabama. There were no holes below 12,000 ft. during 1949 in Mississippi and Florida.

On an all-time basis, Louisiana claims 396 of the 514 wells below 12,000 ft. (see Table 4). Of the remaining holes, Texas has accounted

TABLE 1—NUMBER OF TESTS DRILLED BELOW 12,000 FT. BY YEARS

Year	Below 16,000 ft.	15,000 to 16,000 ft.	14,000 to 15,000 ft.	13,000 to 14,000 ft.	12,000 to 13,000 ft.	Total
1949	0	6	12	31	63	112
1948	1	4	14	37	70	126
1947	1	4	6	10	58	79
1946	0	0	5	13	39	57
1945	0	2	2	7	33	44
1944	1	0	0	2	26	29
1943	0	0	1	4	10	15
1942	0	0	0	1	9	10
1941	0	0	0	0	11	11
1940	0	0	0	2	5	7
1939	0	0	0	2	12	14
1938	0	0	0	3	2	5
1937	0	0	0	0	5	5
Total	3	16	40	112	343	514

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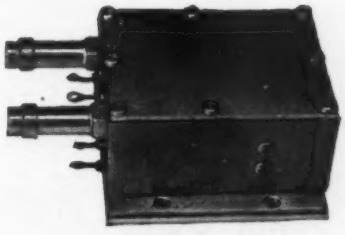

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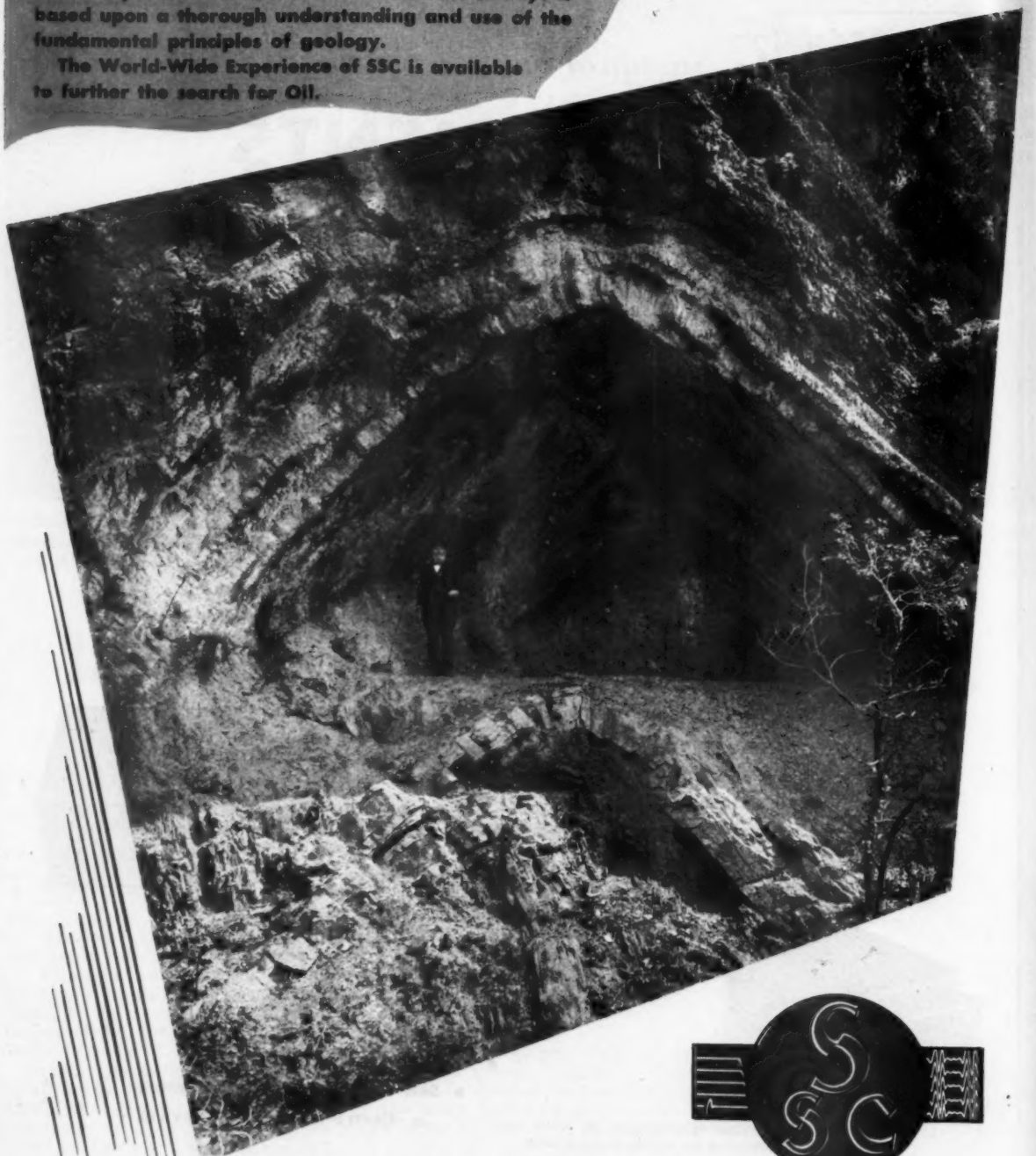

This plate shows an excellent example of Symmetrical Anticlinal Folding in a structure near Hancock, Md.

Seismograph Service Corporation

Table 2—Gulf Coast Wells Drilled Below 13,500 Ft.—All Time

(THROUGH MAY 1, 1950)

Company, well and location—	Total depth (ft.)	Date completed, status
17,000-Ft. Wells		
George Vasen 1 Fee, Stone County, Mississippi	17,001	Coring, currently
16,000-Ft. Wells		
Phillips Petroleum Co. 3 Fannie Schoeppe, Millican, Brazos County, Texas	16,655	July 1944, abandoned
The Texas Co. 4 State-Barataria Bay, Queen Bess Island, Jefferson Parish, Louisiana	16,106	August 1948, abandoned
The Texas Co. 6 Yturria L. & L. Co., Raymondville, Willacy County, Texas	16,006	April 1947, abandoned
15,000-16,000-Ft. Wells		
Shell Oil Co. 1 Weeks-Gall State Unit 1, Weeks Island, Iberia Parish, Louisiana (comp. at 14,150 ft.)	15,913	September 1949, oil producer
Superior Oil Co. of Calif. 1 Casie Bradford, wildcat, Forrest County, Mississippi	15,730	May 1947, abandoned
Humble Oil & Refining Co. 2 J. R. Williams, wildcat, Washington County, Alabama	15,659	February 1949, abandoned
The Texas Co. 1 State Lease 646, Queen Bess Island, Jefferson Parish, Louisiana	15,604	September 1948, abandoned
The Texas Co. 6 State-Atchafalaya Bay, Belle Isle, St. Mary Parish, Louisiana	15,549	February 1948, abandoned
The Texas Co. 13-2 State-Lake Pelto, Lake Pelto, Terrebonne Parish, Louisiana	15,543	December 1948, abandoned
The Texas Co. 1 Lafourche Basin Levee Dist., Queen Bess Island, Jefferson Parish, Louisiana (comp. at 13,904 ft.)	15,523	July 1947, gas-condensate
Union Producing Co. 2 Buckley-Mahler, DeLarge, Terrebonne Parish, Louisiana (comp. at 13,350 ft.)	15,470	October 1949, gas producer
Humble Oil & Refining Co. 10 E. F. Milo, Tomball, Harris County, Texas (comp. at 5,600 ft.)	15,452	December 1945, oil producer
Quintana Petroleum Co. 3-D South Texas Syndicate, wildcat, McMullen County, Texas	15,301	February 1945, abandoned
Gulf Refining Co. 1 State, wildcat, Monroe County, Florida	15,155	April 1947, abandoned
Superior Oil Co. 3 South Texas Development Co., Lake Creek, Montgomery County, Texas	15,154	April 1949, gas-injection
Humble Oil & Refining Co. 2 Cote Blanche-Coffee Fee, Cote Blanche area, St. Mary Parish, Louisiana	15,140	July 1947, abandoned
Shell Oil Co. A-1 J. A. Smith, Weeks Island, Iberia Parish, Louisiana (comp. at 14,243 ft.)	15,094	November 1948, oil producer
The Texas Co. 1 State Lease 919-Leeville, wildcat, Leeville area, Lafourche Parish, Louisiana	15,003	February 1949, abandoned
14,000-15,000-Ft. Wells		
The Texas Co. 1 A. J. Caillouet et al, Leeville, Lafourche Parish, Louisiana (comp. at 13,740 ft.)	14,997	August 1949, oil producer
Humble Oil & Refining Co. 1 St. Lse. 1452, Lake Raccourci, Lafourche Parish, Louisiana (comp. at 14,434 ft.)	14,918	October 1949, gas-condensate
Shell Oil Co. 4 Smith-State Unit "B," Weeks Island, Iberia Parish, Louisiana	14,900	March 1949, oil producer
Placid Oil Co. 1 City of New Orleans, wildcat, Lafourche Parish, Louisiana	14,767	July 1949, abandoned
Shell Oil Co. B-2 Smith-State Unit, Weeks Island, Iberia Parish, Louisiana (comp. 14,015 ft.)	14,704	June 1948, oil producer
The Texas Co. 2 State-Barataria Bay, Queen Bess Island, Jefferson Parish, Louisiana	14,577	September 1946, abandoned
Superior Oil Co. 3 Louisiana L. & E. Co., Unit 14, Four Isle Dome, Terrebonne Parish, Louisiana (comp. at 12,430 ft.)	14,564	April 1949, gas-condensate
Humble Oil & Refining Co. 1 State-Calcasieu Lake, Cameron Parish, Louisiana	14,553	January 1948, abandoned
The Texas Co. 1 State-Barataria Bay, Queen Bess Island, Plaquemines Parish, Louisiana (comp. at 11,407 ft.)	14,490	December 1945, gas-condensate
Shell Oil Co. 1 Weeks-Gall State Unit 2, Weeks Island, Iberia Parish, Louisiana (comp. at 14,226 ft.)	14,476	January 1950, oil producer
The Texas Co. 111 LLE-Leeville, Leeville, Lafourche Parish, Louisiana (comp. at 14,075 ft.)	14,473	July 1948, oil producer
Humble Oil & Refining Co. 4-B J. M. Burguieres Co., Ltd., Weeks Island, Iberia Parish, Louisiana	14,470	December 1948, abandoned
Humble Oil & Refining Co. 1 State Lease 1452, Lake Raccourci discovery, Lafourche Parish, Louisiana	14,650	April 1949, oil producer
Humble Oil & Refining Co. 1 Humble Fee-Hole 2, Weeks Island, Iberia Parish, Louisiana	14,443	May 1949, abandoned
The Texas Co. 2 Realty Operators, Vacherie, St. James Parish, Louisiana	14,413	April 1948, abandoned
Shell Oil Co. 3 Smith-State, Weeks Island, Iberia Parish, Louisiana (comp. at 13,888 ft.)	14,397	March 1947, oil producer
Humble-Continental Oil Co. 1 James Baldwin et al, Tamina area, Montgomery County, Texas	14,382	October 1947, abandoned
Abercrombie-Harrison 1 McDonald, Old Ocean, Brazoria County, Texas (comp. at 12,709 ft.)	14,378	May 1943, oil producer
Shell Oil Co. Smith State Unit 1, Weeks Island, Iberia Parish, Louisiana (comp. at 13,950 ft.)	14,350	January 1950, oil producer
Humble Oil & Refining Co. 1 Lake-Palourde, State Lease 1603, wildcat, St. Mary Parish, Louisiana	14,319	March 1949, abandoned
The Texas Co. 1 Dugas & LeBlanc, Ltd., wildcat, Napoleonville dome, Assumption Parish, Louisiana	14,318	July 1948, abandoned
Shell Oil Co. 2 Smith-State, Weeks Island, Iberia Parish, Louisiana (comp. at 13,778 ft.)	14,301	April 1946, oil producer
Superior Oil Co. 4 Continental Ld. & Fur., wildcat, Bayou Penchant, Terrebonne Parish, Louisiana	14,296	May 1948, abandoned
Hassie Hunt Trust 2 J. Sulie Broussard, Outside Island, Vermilion Parish, Louisiana	14,279	October 1949, abandoned
The Texas Co. D-1 State Lease 649-Point au Fer, wildcat, Terrebonne Parish, Louisiana	14,251	September 1948, abandoned
Superior Oil Co. of California 2 State-L.L.E. Unit 12, Four Isle, Terrebonne Parish, Louisiana (comp. at 13,475 ft.)	14,220	September 1947, gas-condensate
The California Co. 4 E. P. Brady, Alliance, Plaquemines Parish, Louisiana (comp. at 9,082 ft.)	14,187	October 1946, gas-condensate
Stanolind Oil & Gas Co. 2 State-Timbalier Bay, Lafourche Parish, Louisiana	14,147	March 1948, abandoned
The Texas Co. 1-C State-Bay St. Elaine, Bay St. Elaine, Terrebonne Parish, Louisiana (comp. at 13,718 ft.)	14,137	October 1948, gas-condensate
Stanolind Oil & Gas Co. 4 Franz Huebner, Lucky, Matagorda County, Texas (comp. at 8,047 ft.)	14,100	October 1946, oil producer
Stanolind Oil & Gas Co. 1 G. W. Henry, wildcat, McMullen County, Texas	14,046	June 1948, abandoned
The Texas Co. 1 Cameron County Water Control & Improvement Dist. 5, wildcat, Cameron County, Texas	14,033	July 1948, abandoned
Shell Oil Co. 1 Smith-State, Weeks Island, Iberia Parish, Louisiana (comp. at 13,250 ft.)	14,023	April 1945, oil producer
The Texas Co. 45 State-Lake Barre, Lake Barre, Terrebonne Parish, Louisiana (comp. at 11,924 ft.)	14,021	October 1946, gas-condensate
Humble Oil & Refining Co. 1 State Lease 1480, Lake Raccourci, Lafourche Parish, Louisiana (comp. at 12,135 ft.)	14,013	September 1949, gas-condensate
Pan American Production Co. 1 Claude Boudreaux, Lake Quitman, Terrebonne Parish, Louisiana	14,012	March 1947, abandoned
Gulf Refining Co. D-3 St. Martin Land, Section 28, St. Martin Parish, Louisiana (comp. at 12,298 ft.)	14,000	September 1949, gas-condensate
Shell Oil Co. 1-B Smith-State, Weeks Island, Iberia Parish, Louisiana (comp. at 10,862 ft.)	14,000	December 1947, oil producer
Humble Oil & Refining Co. 2 J. M. Burguieres Co., Cote Blanche area, St. Mary Parish, Louisiana	14,000	March 1948, abandoned

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TABLE 2—GULF COAST WELLS DRILLED BELOW 13,500 FT.—ALL TIME (Continued)

13,500-14,000-Ft. Wells

Company, well, and location—	Total depth (ft.)	Date completed, status
Shell Oil Co. A-3 Weeks Island State Unit, Weeks Island, Iberia Parish, Louisiana (comp. at 13,775 ft.)	13,977	July 1949, oil producer
Kerr-McGee Oil Industries 1 State Lease 750, Block 28, Terrebonne Parish, Louisiana (comp. at 8,482 ft.)	13,975	July 1949, gas-condensate
The California Co. 1 Louisiana State Lease 822, West Delta, Block 34, offshore Plaquemines Parish, Louisiana	13,968	December 1948, abandoned
Quintana Petroleum Corp. 1 J. H. Harvey, gas discovery, San Patricio County, Texas (comp. at 9,978 ft.)	13,950	May 1949, gas producer
Union Producing Co. 4 Buckley-Bourg, DeLarge, Terrebonne Parish, Louisiana	13,941	April 1950, abandoned
Union Oil Co. of California 4-C Louisiana Furs, Fresh Water Bayou, Vermilion Parish, Louisiana (comp. at 11,555 ft.)	13,941	December 1946, gas producer
British-American Oil Co. 1 A. M. Dupont Corp., Lapeyrouse, Terrebonne Parish, Louisiana (comp. at 12,640 ft.)	13,857	October 1946, oil producer
Gulf Refining Co. 1-F Calcasieu Natl. Bank, Hayes, Calcasieu Parish, Louisiana	13,856	December 1946, abandoned
Shell Oil Co. 2 Smith-State Unit C, Weeks Island, Iberia Parish, Louisiana (comp. 13,728 ft.)	13,839	July 1949, oil producer
Placid Oil Co., et al, 1 Otho Shows, Ovett, Jones County, Mississippi	13,825	July 1948, abandoned
The Texas Co. 12 State-Cote Blanche, Cote Blanche Bay, St. Mary Parish, Louisiana (comp. at 13,300 ft.)	13,824	May 1948, gas-condensate
The Texas Co. 6 City of New Orleans, Leeville, Lafourche Parish, Louisiana	13,823	June 1948, abandoned
Richard W. Norton, Jr., 5 Dantzler Lbr. Co., wildcat, Stone County, Mississippi	13,820	February 1949, oil producer
Magnolia Petroleum Co. 1 L. F. Duos, Mamou, Evangeline Parish, Louisiana (comp. at 11,780 ft.)	13,800	August 1946, oil producer
Magnolia Petroleum Co. B-1 State Lease 673, Eugene Island, Block 48 discovery, Terrebonne Parish, Louisiana (comp. at 11,206 ft.)	13,800	January 1950, gas-condensate
Gulf Refining Co. 1 Provost-Cyr. Unit, Weeks Island, Iberia Parish, Louisiana (comp. at 13,396 ft.)	13,786	March 1950, oil producer
Humble Oil & Refining Co. 2 State Lease 1480, Weeks Island, Lafourche Parish, Louisiana comp. at 12,992 ft.)	13,780	March 1950, oil producer
The Texas Co. 20 Sunset Realty & Planting Co., Paradis, St. Charles Parish, Louisiana (comp. at 11,042 ft.)	13,760	July 1948, gas-condensate
The Texas Co. 2 Mary A. Smythe Nelson et al, Point au Fer, Terrebonne Parish, Louisiana	13,741	July 1948, abandoned
Union Producing Co. 1 Minnie Brown, Agua Dulce, Nueces County, Texas (comp. at 4,603 ft.)	13,728	February 1939, gas producer
The Texas Co. 2 Bender Estate, Humble, Harris County, Texas	13,728	February 1947, abandoned
Amerada Petroleum Corp. 1 H. A. Godejohn, wildcat, Montgomery County, Texas (comp. at 5,620 ft.)	13,691	May 1949, gas-condensate
McCarthy Oil & Gas Corp. 1 E. H. Niedringhaus et al, Blue Lake, Brazoria County, Texas (comp. at 11,016 ft.)	13,640	August 1948, gas-condensate
Magnolia Petroleum Co. 1 State Lease 838, Block 45, Eugene Island area, Iberia Parish, Louisiana (comp. at 11,351 ft.)	13,636	November 1948, gas-condensate
Superior Oil Co. 1-A Gulf of Mexico-State Lease 884, Block 71, Vermilion area, Vermilion Parish, Louisiana (comp. at 9,608 ft.)	13,628	July 1948, gas-condensate
Superior Oil Co. of California 3 State-Calcasieu Lake, wildcat, Cameron Parish, Louisiana	13,610	1940, abandoned
Hunt Oil Co. et al 1 State Lease 1392-Goodrich Unit 1, Duck Lake, St. Martin Parish, Louisiana (comp. at 12,404 ft.)	13,595	July 1949, gas producer
Union Producing Co. 2 Buckley-Bourg, Bayou DeLarge, Terrebonne Parish, Louisiana (comp. at 13,586 ft.)	13,586	1940, gas-condensate
McCarthy Oil & Gas Corp. 1 W. H. Ector, Blue Ridge, Fort Bend County, Texas	13,578	July 1949, abandoned
Shell Oil Co. 5 Smith State Unit 1, Weeks Island, Iberia Parish, Louisiana (comp. at 13,505 ft.)	13,575	October 1949, oil producer
Union Producing Co. 3 Buckley-Bourg, Bayou DeLarge, Terrebonne Parish, Louisiana	13,570	January 1948, abandoned
The Texas Co. 1 Bender Estate, Humble, Harris County, Texas	13,561	1946, abandoned
Union Producing Co. 1 Fitzpatrick & Vizard, Bayou DeLarge, Terrebonne Parish, Louisiana (comp. at 13,490 ft.)	13,560	July 1943, gas-condensate
The Texas Co. 1 Bradish-Johnson, wildcat, Plaquemines Parish, Louisiana	13,560	March 1947, abandoned
Superior Oil Co. of Calif. 1-9 L.L.&E., Four Isle dome, Terrebonne Parish, Louisiana (comp. at 12,093 ft.)	13,560	October 1949, gas-condensate
The Chicago Corp. 1 E. Heinsch, West Corpus, Nueces County, Texas (comp. at 8,594 ft.)	13,530	September 1948, gas-condensate
Placid Oil Co. 1 B. L. Sholar, Ovett, Jones County, Mississippi	13,524	May 1948, abandoned
Humble Oil & Refining Co. 2 Gulf Coast Realties, Sunniland, Collier County, Florida	13,512	October 1944, abandoned
Humble Oil & Refining Co. 3 Sauz Ranch-Tenerias Pasture, wildcat, Kenedy County, Texas	13,509	May 1948, abandoned
Stanolind Oil & Gas Co. 2 E. B. Norman, wildcat, Orleans Parish, Louisiana	13,505	March 1948, gas-condensate
Sun Oil Co.-Sohio Oil Co. 3 Elizabeth Regan, Egan, Acadia Parish, Louisiana (comp. at 11,880 ft.)	13,500	May 1946, gas-condensate

for 91, Mississippi 14, Florida 9, and Alabama 4.

A Mississippi wildcat, now coring below 17,000 ft., has just broken the deep-drilling record of the Gulf Coast area. It is the George Vasen 1 fee, SW NE 9-2s-11w, 2½ miles northeast of Wiggins, Stone County. Drilling contractor for Vasen's Gulf Coast record breaker is Martin Harris Drilling Co. The operators have not announced how much farther the hole will be carried. Previous record holder was Phillips Petroleum Co. 3 Fannie Schoeppe, Brazos County, Texas, reaching 16,655 ft.

For Mississippi, the previous depth record has been held by the Superior Oil Co. 1 Cassie Bradford, 1-3n-13w. It reached 15,730 ft. before being abandoned as dry in June 1947. It

TABLE 3—NUMBER OF TESTS DRILLED BELOW 12,000 FT. BY STATES IN 1949

District—	Below 16,000 ft.	15,000 to 16,000 ft.	14,000 to 15,000 ft.	13,000 to 14,000 ft.	12,000 to 13,000 ft.	Total
Louisiana coast	0	4	12	26	51	93
Texas coast	0	1	0	5	12	18
Mississippi	0	0	0	0	0	0
Alabama	0	1	0	0	0	1
Florida	0	0	0	0	0	0
Total	0	6	12	31	63	112

TABLE 4—NUMBER OF TESTS DRILLED BELOW 12,000 FT. BY STATES—ALL TIME

District—	Below 16,000 ft.	15,000 to 16,000 ft.	14,000 to 15,000 ft.	13,000 to 14,000 ft.	12,000 to 13,000 ft.	Total
Louisiana coast	1	9	34	82	270	396
Texas coast	2	3	5	22	59	91
Mississippi	0	1	1	5	7	14
Alabama	0	2	0	0	2	4
Florida	0	1	0	3	5	9
Total	3	16	40	112	343	514

In 1940 there was . . . *1*

In 1944 there were . . . *215*

In 1948 there were . . . *500*

and as of May 1950 there are more than

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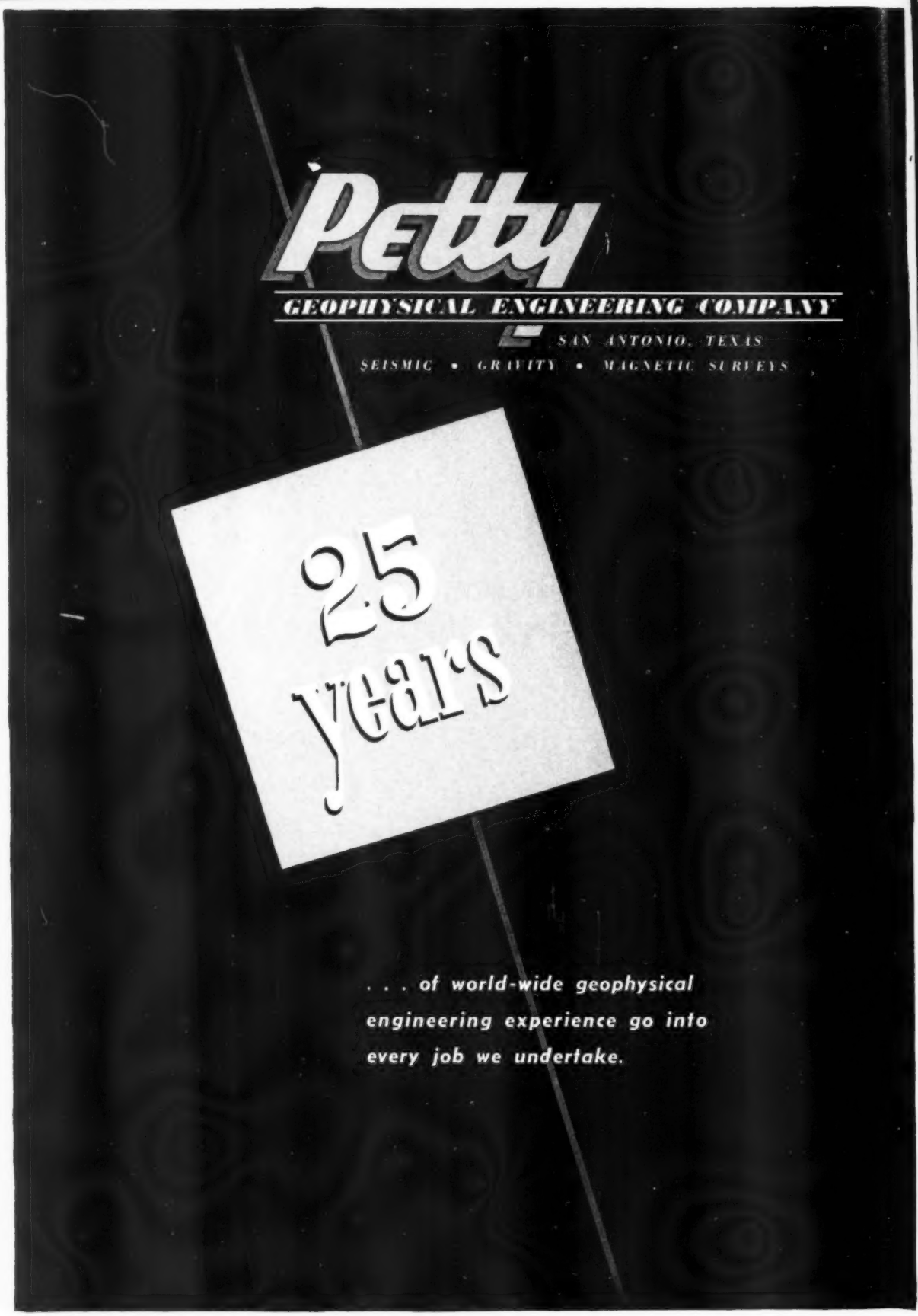
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TABLE 5—NUMBER OF PRODUCING WELLS COMPLETED BELOW 12,000 FT. BY FIELDS—ALL TIME
(Includes figures through May 1, 1950)

Field and location—	14,000 to 15,000 ft.	13,000 to 14,000 ft.	12,000 to 13,000 ft.	Total
Weeks Island, Iberia Parish, Louisiana	5	14	4	23
Bayou DeLarge, Terrebonne Parish, Louisiana	0	5	0	5
Venice, Plaquemines Parish, Louisiana	0	0	4	4
Four Isle, Terrebonne Parish, Louisiana	0	1	7	8
Horseshoe Bayou, St. Mary Parish, Louisiana	0	0	3	3
Leeville, Lafourche Parish, Louisiana	1	2	1	4
Bayou Sale, St. Mary Parish, Louisiana	0	0	1	1
Bay St. Elaine, Terrebonne Parish, Louisiana	0	2	1	3
Cote Blanche Bay, St. Mary Parish, Louisiana	0	1	0	1
Lake DeCade, Terrebonne Parish, Louisiana	0	1	0	1
Lake Hermitage, Terrebonne Parish, Louisiana	0	0	1	1
Lake Pelto, Terrebonne Parish, Louisiana	0	0	1	1
Lapeyrouse, Terrebonne Parish, Louisiana	0	0	1	1
Old Ocean, Brazoria County, Texas	0	0	1	1
Ovett, Jones County, Mississippi	0	1	0	1
Queen Bess Island, Jefferson Parish, Louisiana	0	1	0	1
South Mayes, Chambers County, Texas	0	0	1	1
South Oberlin, Allen Parish, Louisiana	0	0	1	1
Lake Raccourci, Lafourche Parish, Louisiana	1	0	2	3
Branch, Acadia Parish, Louisiana	0	0	1	1
Manila Village, Jefferson Parish, Louisiana	0	0	1	1
Duck Lake, St. Martin Parish, Louisiana	0	0	2	2
Section 28, St. Martin Parish, Louisiana	0	0	1	1
Total	7	28	34	69

tested noncommercial shows in the Lower Cretaceous.

Twenty-three fields, to date, have found production below 12,000 ft. in the Gulf Coast. Twenty of these fields are in Louisiana, two in Texas, and one in Mississippi (see Table 5). Weeks Island field is far ahead on the list with 23 wells below 12,000 ft. as of May 1, 1950. In second place is Four Isle field of Terrebonne Parish, Louisiana.

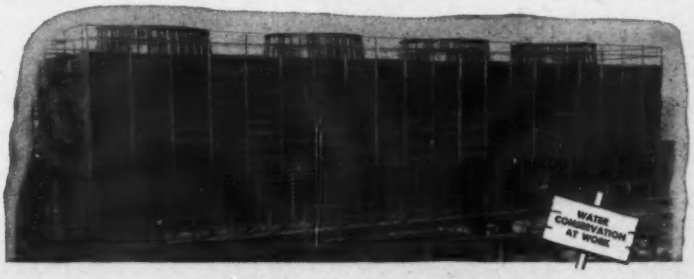
On the technical side, the local A.P.I. chapter in Houston concluded during the year a study-group investigation of equipment and techniques for 20,000-ft. drilling. The conclusions were presented by John M. Payne of Shell in a paper delivered at the annual A.P.I. meeting in Chicago.* According to Payne: "With oil now being produced from below 15,500 ft., it seems inevitable that the need for 20,000-ft. commercial drilling will develop in the near future. Many equipment limitations already have been reached in drilling the record wells of today. Deep drilling is an exact science for which the equipment must be carefully engineered if it is to do a specific job. Although one rig has successfully drilled to more than 20,000 ft., drilling in different localities, as well as completing a well at that depth—all within a reasonable amount of time and expense—may offer a large number of problems which as yet have not been solved. . . ."

*Payne, John M., "Equipment and Techniques for 20,000-Ft. Drilling," The Oil and Gas Journal, November 10, 1949, p. 331.

I.N.G.A.A. Meeting

HOUSTON.—Plans are being prepared for the 1950 annual meeting of the Independent Natural Gas Association of America, which will be held at the Shamrock Hotel here October 23.

Details of the program and list of speakers will be announced in the near future, I.N.G.A.A. said.



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WILDCATTING IN FLORIDA

by J. E. Banks

THE frontier of the Gulf Coast oil business lies in Florida and extends from Pensacola to Key West, the longest tidelands belt of any state. This large, prospective oil territory has attracted attention because prolific limestone production might be found in South Florida as well as "Woodbine" production around the Ocala uplift in North Florida, and also partly because it is free from proration.

Geologically, Florida is part of the Cretaceous oil and gas belt which continues through Mississippi, northern Louisiana, southern Arkansas, Texas, and Mexico. Cretaceous sediments of northern Florida grade vertically from chalk to sand and shale; but in southern Florida the gradation is from chalk to lime and anhydrite. In both North and South Florida the maximum thickness of the Cretaceous is estimated to be in excess of 10,000 ft.; over the Ocala uplift the section thins to 1,500 ft.

In Florida, the wildcatter has not been assisted by oil and gas seeps or by surface indications of deep structures. Nature has masked the Cretaceous oil fields with a thick covering of "reef type" Tertiary limestone. So far only one deep anticline is known. This Cretaceous structure is productive from a thin limestone near the top of the Sunniland zone, of Glen Rose age, and which is the most persistent zone of oil and gas shows in Florida. The Sunniland zone in general is marine, thin bedded, and grades vertically from dolomite, to coquina, to chalky limestone, to marl. It is 250 ft. thick and is overlain and underlain by thick anhydrite beds.

The search for oil and gas in Florida has been difficult. The thick blanket of cavernous and irregularly bedded lime of Tertiary age greatly reduces the value of core drill and seismograph exploration. In addition, Florida has a Paleozoic "basement" complex of sedimentary and igneous rocks which obscures the interpretation of gravity and magnetic data. For the present the oil deposits of Florida are well hidden but the expected development of sharper exploration tools adapted to limestone areas may soon give renewed hope to the Florida wildcatters.

Drilling Costs for Florida

Florida oil activities are located 500 to 1,000 miles from most supplies and services. This factor alone greatly increases drilling costs. Typical examples of Florida drilling operations are the seven wildcats recently completed by Coastal Petroleum Co. at an average cost of $15.70 per foot. The individual well costs appear in Table 1.

East and south of Tallahassee the Florida wildcatter does not have the protection of the footage contract. Unusual drilling problems start at the surface and continue until the widespread zone of lost circulation or water flow is completely penetrated and cased.

Central Florida is covered with loose sand, in part resting on cavernous limestone and in part separated from the limestone by clay beds. For many years the surface sand has been sifting down into the cavernous limestone, leaving small and large sink holes at the surface. Drilling operations can easily speed up this natural process.

Cave-ins under the derrick foundations are common, necessitating quick cement jobs, more casing, or skidding the entire rig on very short notice. Operators usually provide two surface strings of casing. The first is set just into the limestone before circulation can be lost. The second is set a hundred feet or so into the lime-

The Coastal Petroleum Co. 1 Wright, located near Old Tampa Bay, 4 miles north of St. Petersburg, Fla., was drilled to a depth of 11,507 ft. in 137 days. Contractor for the wildcat was Parker Drilling Co. of Tulsa. All of the cavities in the hole could not be cased off because of the casing shortage of early 1948. As a result, the test was drilled to a total depth with salt water rather than mud.

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Houston is the hub of the Southwest's petroleum industry. The 19 counties comprising the immediate Houston territory, though constituting only 6% of the area of Texas, produce 20% of its petroleum and contain 40% of its refining operations, including the world's largest refinery. Houston is the major terminal of 36,500 miles of pipe lines that serve the producing areas of Texas, and the Port of Houston now holds rank as the nation's second port, due in large measure to its huge tonnage of petroleum and petroleum products. These facts establish Houston as the key city in the world's petroleum activity.

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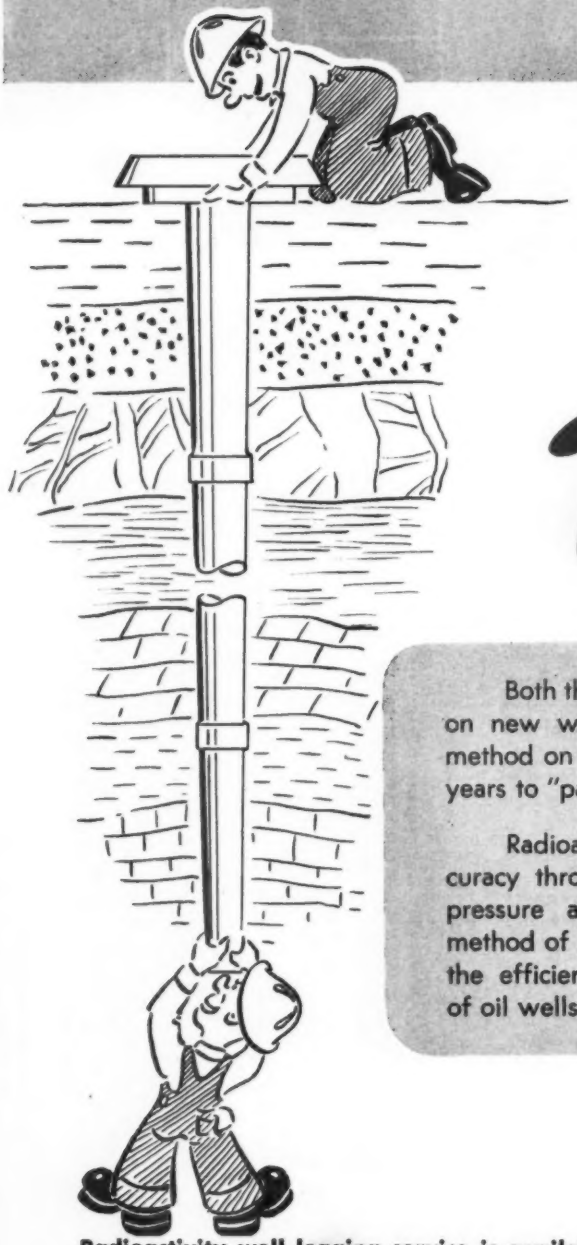

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The Author

J. E. Banks, chief geologist for Coastal Petroleum Co., St. Petersburg, Fla., received his bachelor of arts degree from Wabash College in 1935. He did graduate work at University of Iowa, receiving an M.E. degree in geology in 1937. Following college, Banks worked 3 years for The Texas Co. as a geologist in that firm's Barco concession in Colombia, S.A. From 1940 to 1942, he did further graduate work at Cornell University. He then spent a little over a year with the U. S. Engineers at Ithaca, N. Y., before returning to Texaco in Midland, Tex. Banks entered Florida geological work in 1945 as a geological scout for Stanolind Oil & Gas Co. in Tallahassee. He has been in his present position since 1947.

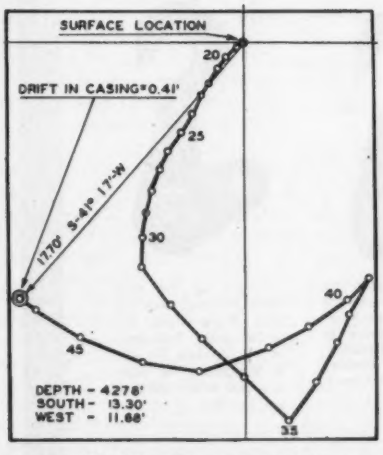

Fig. 1—This interesting directional survey shows that a Coastal well actually reversed direction in a cavernous limestone zone. This reversal occurred at about 3,600 ft. in a 10,500-ft. test, resulting in obvious drilling difficulties.

DRIFT IN ZONE OF CAVITIES

	Depth, ft.	Direction	Angle
30	2,743	S08W	0°45'
31	2,837	South	0°55'
32	2,931	S37E	1°30'
33	3,023	S40E	1°30'
34	3,135	S48E	1°50'
35	3,208	S47E	2°00'
36	3,301	N35E	1°30'
37	3,393	N28E	1°30'
38	3,486	N22E	1°00'
39	3,580	N30E	1°15'
40	3,673	S45W	1°00'
41	3,766	S55W	1°30'
42	3,859	S62W	1°30'
43	3,953	S72W	2°20'
44	4,047	N80W	1°50'
45	4,142	N69W	2°00'
46	4,236	N58W	1°40'
47	4,278	N51W	1°30'

Fig. 2—This bent drill pipe resulted from insufficient wall support while drilling in cavernous limestone. The fish was recovered with difficulty through the 13⅜-in. surface casing in the hole.

stone or below any additional sand.

In South Florida the loose sand zone is covered by several hundred feet of younger limestone. If the derrick is built on these limestones there are no foundation problems; however, two surface strings of casing may still be needed because circulation may be lost in the limestones above the loose sand as well as in the older limestones below. In both North and South Florida, operators mud up to drill the sand zones of Pleistocene and Miocene ages.

The most common drilling hazard in Florida is loss of circulation in thick cavernous limestones. Drilling blind for 1,500 to 6,000 ft. is expected of the drilling contractors. In North Florida this zone of repeated cavities is thin and in places exposed at the surface. In South Florida the same zone of lost circulation is much thicker and is covered by 1,000 to 2,000 ft. of Miocene to Recent sediments. The individual cavities are characteristically thin and may not be noticed by the driller until the mud has disappeared.

Technically a cavity is a zone of

TABLE 1—FLORIDA WILDCATS DRILLED BY COASTAL PETROLEUM CO.

County, well and farm—	Footage	Drilling days	Date comp.	Contractor	Gross cost	Participation by others
Levy, 1 Ragland	5,850	65	10-19-47	Crow	$96,900	$50,000
Pinellas, 1 Wright	11,507	139	7- 8-48	Parker	192,800	65,000
Jefferson, 1 Larsh	7,913	60	1-13-49	Parker	100,700	46,000
Lafayette, 1 Sapp	*6,000	30	3-19-49	Parker	53,900	27,000
Monroe, 1 State Lse. 363	7,559	78	9-30-49	Parker	118,500	15,000
Dade, 1 State Lse. 340-A	11,520	77	12-18-49	Loffland	198,000	138,600
Monroe, 1 Williams	6,702	97	2- 5-50	Parker	136,000	22,300
Totals	57,051	546			$896,800	$363,900

*This test was actually bottomed at 3,507 ft. in Paleozoic basement but Coastal received 6,000 ft. credit toward its 60,000-ft. drilling obligation with the state of Florida on 4,800,000 acres of water bottom lands.

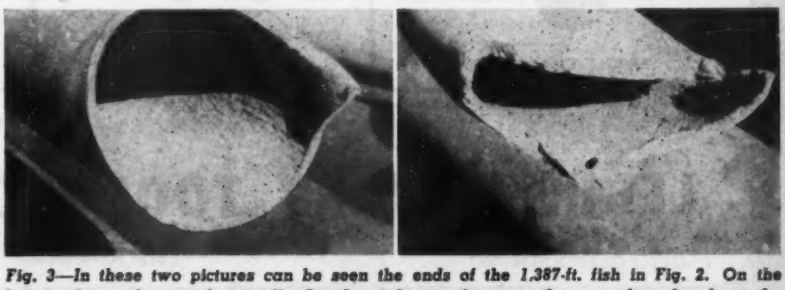

Fig. 3—In these two pictures can be seen the ends of the 1,387-ft. fish in Fig. 2. On the left is shown the initial twistoff. On the right can be seen the secondary break at the bottom end of the drill pipe.

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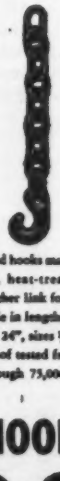

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excessive permeability and porosity formed in limestone by circulating ground water. Numerous small and large cavities are present throughout the zone of lost circulation. An individual cavity can usually be sealed off using cement and crushed rock, but the job of sealing off multiple cavities is at present uneconomic. Many of the cavities are large enough to permit the drill cuttings to escape into the formation. More numerous are the smaller cavities capable of taking fluid but not cuttings. The repeated loss of cuttings in large cavities is the ideal drilling condition. Also, chalk lends itself to drilling without returns because it disintegrates into the drilling fluid. Under ideal conditions the over-all drilling rate without returns in cavernous limestone or chalk can easily exceed that of conventional methods. On the other hand, if the cavities are small and the large cavities widely spaced, the problems of drilling without returns greatly increase and the drilling rate suffers.

Much Water Required

At Coastal Petroleum 1 State, Lease 363, located on Plantation Key in Monroe County, 600 ft. of cuttings accumulated in the hole while drilling 1,200 ft. before being flushed out in a large cavity at 5,620 ft. This required 2 to 6 hours' additional time to wash and ream to bottom with a new bit and 15 to 30 minutes to make each connection while drilling.

Usually a large volume of water is needed to keep the cuttings out of the way of the bit. Even then, large cuttings and cave-ins called "boulders" are continually wedging around the bit and drill collars. At times it is impossible to determine if the bit is drilling or reaming because the same amount of weight and torque may be required. Stuck pipe may occur when the drilling fluid flows into a cavity near the bit instead of lifting the cuttings. A plugged bit, pump failure, twistoff, or delayed connection can also stick the drill pipe.

Stuck pipe is the most common type of fishing job within the zone of lost circulation. Experience has shown that if fluid can be pumped through the bit the pipe can usually be worked loose. Freeing the pipe may take just a few anxious minutes or several long days. The Coastal Petroleum Co. 1 State Lease 363 penetrated the entire zone of cavities. In doing so, the pipe was stuck six times with a loss of 63 hours' drilling time, the longest single period being 2 days.

Cavities affect the drilling operations in other ways. For example, they may cause a sharp directional change in an otherwise normal drilling spiral. The bit on penetrating the floor of a cavity may not deviate appreciably from vertical but can reverse its horizontal direction, as shown in Fig. 1. Such sharp bends in the horizontal component of drilling spiral undoubtedly put an additional strain on the drill pipe.

Drilling-Time Curves

Cavities are associated with hard and broken drilling. The maximum weight of the drill collars is required to drill hard lime beds at a rate of 1 to 4 ft. per hour. Drilling-time curves within the zone of lost circulation correlate poorly at best and frequently not at all. The over-all drilling time for this zone also varies from well to well. In one well it will average 5 minutes per foot, whereas in another within 10 miles the average may be 15 minutes per foot. Apparently the local amount of rock hardening determines the drilling rate at each location.

Hole-size surveys indicate the position of large cavities, but more noticeable is the loss of gage resulting from drilling. Thirty days of drilling with water can double the original hole size opposite chalk and certain shales. Indurated limestone beds tend to remain in gage. A twistoff while drilling without returns through cavities and enlarged hole can be serious, because the drill pipe is not supported and centered by the walls of the hole at all points. A case in point is the Coastal Petroleum Co. 1 Williams located on Key Largo south of Miami. Here the operators set surface casing at 253 and 989 ft.; then

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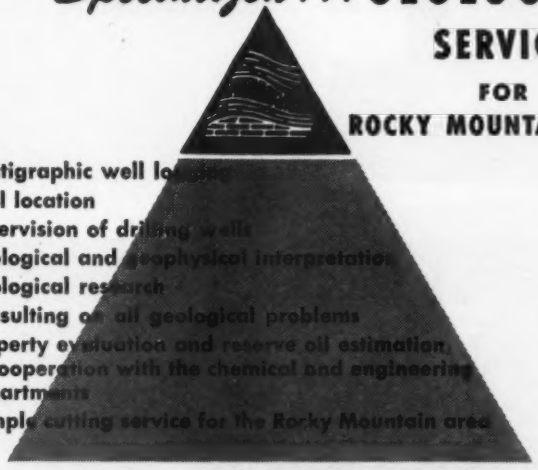

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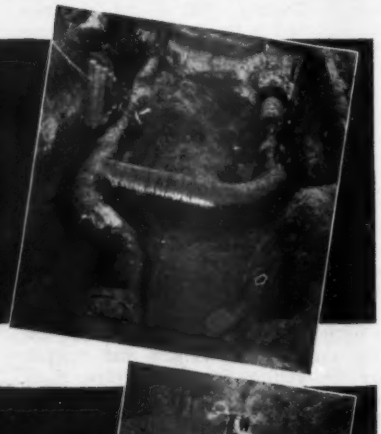

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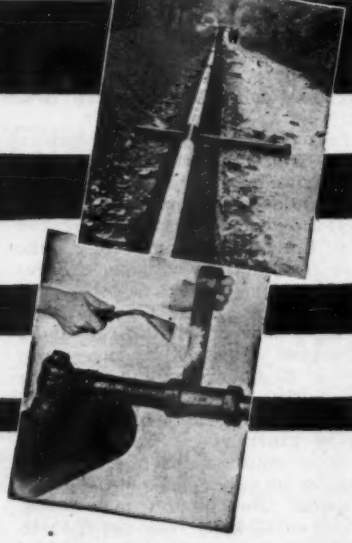

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attempted to drill 5,800 ft. of chalk and cavernous limestone with salt water using five 8-in. drill collars, 4½-in. drill pipe, and diesel-electric power.

To a depth of 6,702 ft., the hard lime formation dulled thirty-three 12¼-in. rock bits. Time lost in reaming to bottom amounted to 168 hours and freeing the pipe 25 times took 119 hours. At this depth, while reaming preparatory to running casing, the bit stuck 18 ft. off bottom and the drill pipe twisted off at 2,200 ft.

Fishing operations revealed that the drill pipe had dropped, bent into the large cavities, and sheared off at several places. The first 1,387-ft. piece of drill pipe was recovered from 3,028 ft., indicating that it had dropped 828 ft. and bypassed the second piece by 122 ft. Photographs of this fish are shown in Figs. 2 and 3. The top of the second fish was located in a cavity at 4,293 ft. but could not be recovered.

Hole-Size Variations

Hole-size variations also affect the casing program. Running one string of casing completely through a long interval of enlarged and tight hole is obviously difficult and hazardous. An intermediate mud string proved very successful in the Coastal 1 Ragland in Levy County because the remainder of the Tertiary section was drilled without loss of circulation, and the hole was completed to basement without the usual long mud string.

Since large quantities of water are used in drilling without returns, it is fortunate that in most parts of Florida there is an abundance of fresh water within a few feet to a few hundred feet of the surface. On the Florida Keys, however, fresh water is not available and drilling costs are therefore greater. Not only is the bill for pump parts excessive but the mud lines and drill pipe can be worn out in one or two locations.

On the bright side of the Florida drilling picture is the almost complete absence of problems after the mud string has been cemented below the cavernous limestone section. Expensive mud treatment is not required. At the Coastal 1 Larsh in Jefferson County, 2,500 ft. of chalky limestone and 4,500 ft. of sand and shale were drilled successfully, using thin bentonite mud and no chemicals. At the 1 Sapp in Lafayette County untreated bentonite mud was used in wire-line coring 200 ft. of sand and shale, resulting in 87 per cent recovery. The Coastal 1 State Lease 340-A in Dade County west of Miami was drilled below the mud string to a depth of 10,600 ft. with fresh water before mudding up. To this depth the water cuttings gave reliable mud-log readings for oil and gas, the formation changes were sharp, and the hole below the chalk section remained in gage.

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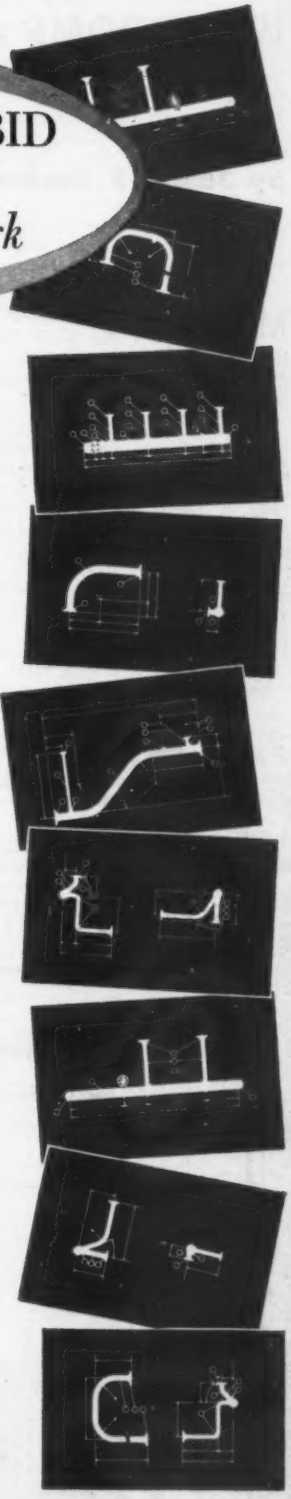

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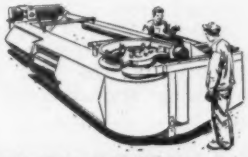

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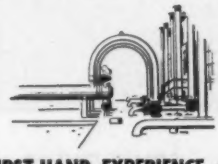

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1950 LOOMS AS PROMISING YEAR IN MISSISSIPPI OIL AND GAS DEVELOPMENT

by James F. Borthwick, Jr.*

MISSISSIPPI'S oil industry may well expect the year 1950 to be its best from the standpoint of new discoveries, if the first 6-month period is any criterion.

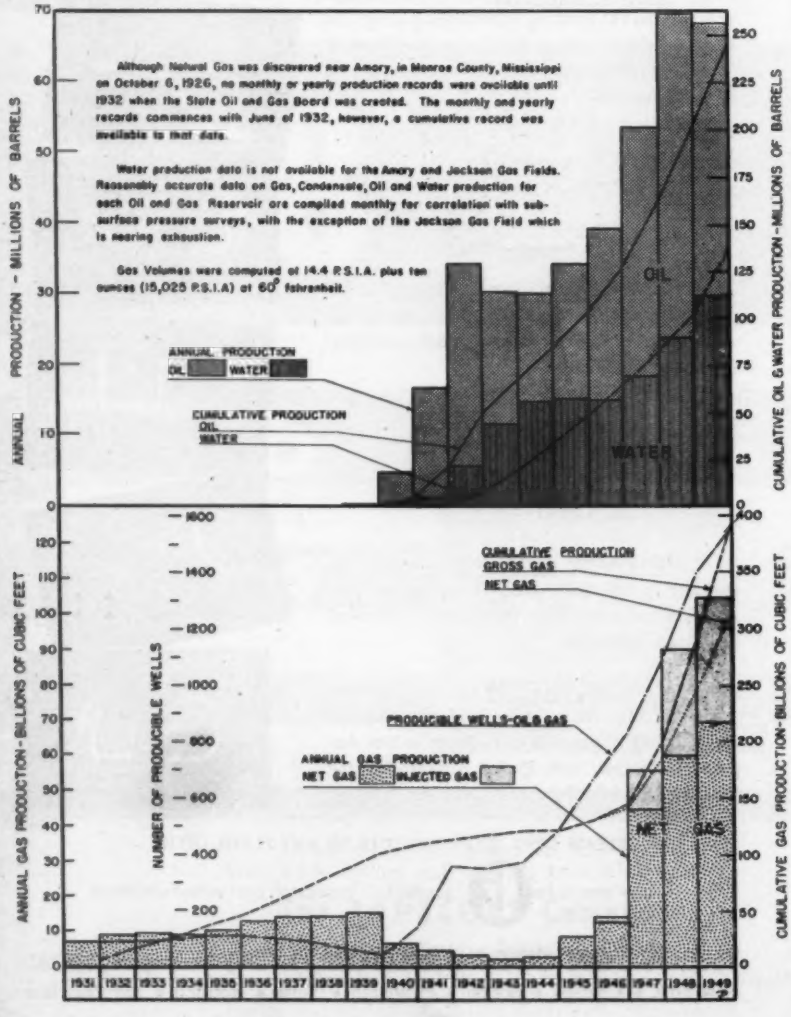
Since the first of the year six wildcat tests have been completed as producers and a new reservoir opened in one of the older fields, whereas in 1949 a total of eight fields were found and two new reservoirs established in proven fields. Adams County in southwestern Mississippi claims the major portion of the new discoveries with six of the seven finds located there.

In January Humble Oil & Refining Co. completed its D-1 McKittrick, Section 50-7n-3w, located in the southwestern city limits of Natchez in Adams County. Production is obtained from a sand in the lower Tuscaloosa series of Upper Cretaceous age with perforations in the casing at 10,300-20 ft. The well is currently producing approximately 1,300 bbl. of oil per month, gravity 27° A.P.I.

In the past 3 months Humble has completed three wildcat wells in the southwestern part of Adams County, between the Sibley area and Armstrong-Ellislie field; all of these wells have been completed in the Wilcox sand of Eocene age. The 1 Alberta Robertson et al., Section 20-4n-3w, was completed in a sand at 6,406-6,510 ft. This well is productive of 29°-gravity oil and produces approximately 150 bbl. per day.

*Mississippi State Oil and Gas Board, Jackson.

BASIC PRODUCTION CHART ON OIL & GAS RESERVOIRS OF MISSISSIPPI


Although Natural Gas was discovered near Amory, in Monroe County, Mississippi on October 6, 1926, no monthly or yearly production records were available until 1932 when the State Oil and Gas Board was created. The monthly and yearly records commences with June of 1932, however, a cumulative record was available to that date.
Water production data is not available for the Amory and Jackson Gas Fields. Reasonably accurate data on Gas, Condensate, Oil and Water production for each Oil and Gas Reservoir are compiled monthly for correlation with subsurface pressure surveys, with the exception of the Jackson Gas Field which is nearing exhaustion.
Gas Volumes were computed at 14.4 P.S.I.A. plus ten ounces (15,025 P.S.I.A) at 60° Fahrenheit.
ANNUAL PRODUCTION - MILLIONS OF BARRELS
CUMULATIVE OIL & WATER PRODUCTION - MILLIONS OF BARRELS
ANNUAL PRODUCTION
OIL
WATER
CUMULATIVE PRODUCTION
OIL
WATER
ANNUAL GAS PRODUCTION - BILLIONS OF CUBIC FEET
CUMULATIVE GAS PRODUCTION - BILLIONS OF CUBIC FEET
NUMBER OF PRODUCIBLE WELLS
CUMULATIVE PRODUCTION
GROSS GAS
NET GAS
PRODUCIBLE WELLS-OIL & GAS
ANNUAL GAS PRODUCTION
NET GAS
INJECTED GAS
1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949

Perforation Depths

Humble 1 Lucy E. Barksdale et al., Section 26-5n-3w, was completed from perforations at 6,571-73 ft. with an initial production gage of 143 bbl. per day of 41.8°-gravity oil. Same operator's 2 Caroline F. Blake et al., Section 23-5n-3w, was completed from perforations at 6,431-35 ft. with an initial 24-hour gage of 176 bbl. of 40.6°-gravity oil. In February Humble set pipe to a total depth of 11,099 ft. at its 1 Roane F. Byrnes, Section 13-5n-3w, and perforated at 10,993-11,000 ft. This well is currently shut down after numerous attempts to obtain a commercial completion, with a small amount of 27°-gravity oil having been produced. Humble is at present drilling below 5,000 ft. on its 2 Roane F. Byrnes, Section 13-5n-3w, with the test expected to be carried to the lower Tuscaloosa sands. Most recent Adams County discovery is Humble 1 James S. Giles, Section 4-7n-3w, located 2 miles north of Natchez. The well was completed from perforations in the lower Tuscaloosa at 10,154-60 ft. and had an initial gage of 730 M.c.f. of gas and 92 bbl. of 57° condensate. The well has a gas-oil ratio of 7,935 : 1; further tests are under way to determine if the new discovery is a high-ratio oil field or a gas-condensate field.

The discoveries this year in Adams County bring the total oil or gas pools located in that county to 14. The older fields in Adams County are: (1) Armstrong-Ellislie, a Wilcox oil sand field. (2) Cranfield is productive from both Wilcox and lower Tuscaloosa sands. (3) LaGrange and South LaGrange oil fields are both productive from the Wilcox horizon. (4) Pine Ridge also is a Wilcox sand oil field. (5) Carthage Point is a gas-condensate reservoir of the lower Tuscaloosa series. Cranfield field has one dry gas well completed in the

Paluxy formation and is connected to the Cranfield pressure-maintenance system.

An interesting notation on the present rate of development in Adams County is that since the first of the year a total of 119 drilling permits have been issued, with 37 being in Adams County. The relatively shallow productive possibilities of the Wilcox sand and a large amount of leased acreage carrying 1950 expiration dates, are expected further to accelerate development in this county.

In Lincoln County, Pan American Production Co. has completed its 1 S. J. Holloway, Jr., Section 23-6n-6e, from sands in the lower Tuscaloosa series at 10,646-84 ft., with an initial daily production gage of 154 bbl. of 41.5°-gravity oil. This area has been designated as West Lincoln oil field. Here also early lease-expiration dates have brought a rapid exploration program with Roeser & Pendleton, Inc., drilling on two offset wells and has two other locations cleared.

Pickens Field

Possibly the most publicized development in the state this last year has been in Pickens field of Yazoo and Madison counties, where early in February Carter Oil Co. completed its 1 J. L. Wilson, Section 30-12n-3e, in the Lower Cretaceous formation at 7,728-37 ft. Initial gage was 159 bbl. of 32°-gravity oil per day. The Carter well was drilled to a total depth of 12,250 ft. to test the commercial possibilities of the Smackover lime and encountered salt at 12,219 ft. Top of the Smackover was at 11,622 ft. and numerous shows were encountered in this horizon with the formation proving to be not porous enough for commercial production. The well was plugged back and completed in what is thought to be the Travis Peak sand. It touched off the largest lease and royalty-buying boom seen in the state since the discovery of oil in Tinsley field, Yazoo County, in 1939.

To date disappointing results have been obtained from subsequent drilling in the northwest edge of the Pickens area, with four dry holes having been recorded. Three of these tests logged shows in several sand sections, but were considered uncommercial. Pickens field was the second oil field to be found in Mississippi. Discovered in the spring of 1940 by Kingwood Oil Co. 1 Wilburn, Section 31-21n-3e, production is from the Eutaw series at approximately 4,800 ft. Pickens is a fault-closure type of structure and currently produces approximately 85,000 bbl. of oil per month, with the Carter completion establishing the first deep production in the 10-year-old field. Carter has location cleared for a west offset to its Wilson well.

In the past years very few of the wildcat wells drilled in the counties of Yazoo and Madison were carried to a depth that would test the sand found in the Carter well, due to the fact that both Tinsley and Pickens fields are productive in sands encountered at less than 5,000 ft. Wildcat drilling in this area is on the increase with all of the scheduled ventures expected to be drilled to sufficient depth to test the producing horizon of the Carter well. Before the year is out at least one more Smackover lime test will be drilled in this general area.

Gas Activity Expanding

In a discussion of Mississippi's possibilities, it can be noted that in the southern part of the state a major gas-producing area is rapidly taking shape. In this section there are four fields currently producing a total of 8 billion cubic feet of gas monthly. The largest field in area, wells, and monthly production, is Gwinville field in Jefferson Davis and Simpson counties. This field now has 75 gas-condensate wells with an approximate developed area of 24,000 acres and has gas-pipe-line outlets connected to two major gas-transmission systems.

In Baxterville field, Lamar and Marion counties, development of the gas reservoir has increased since the completion last fall of a gas pipe line into the fields. The completion of a second gas pipe line into Baxterville is scheduled for June of this year. Baxterville is also productive of low-gravity oil, having 129 oil wells producing from a depth of approximately 8,700 ft. The gas-condensate reservoir at Baxterville is above the oil sand at approximately 7,700 ft.

In Soso gas-condensate field located in Jasper, Jones, and Smith counties, a development prospect has been under way for the past 6 months, resulting in an eastward extension of approximately 2 miles. Soso field has one pipe-line outlet.

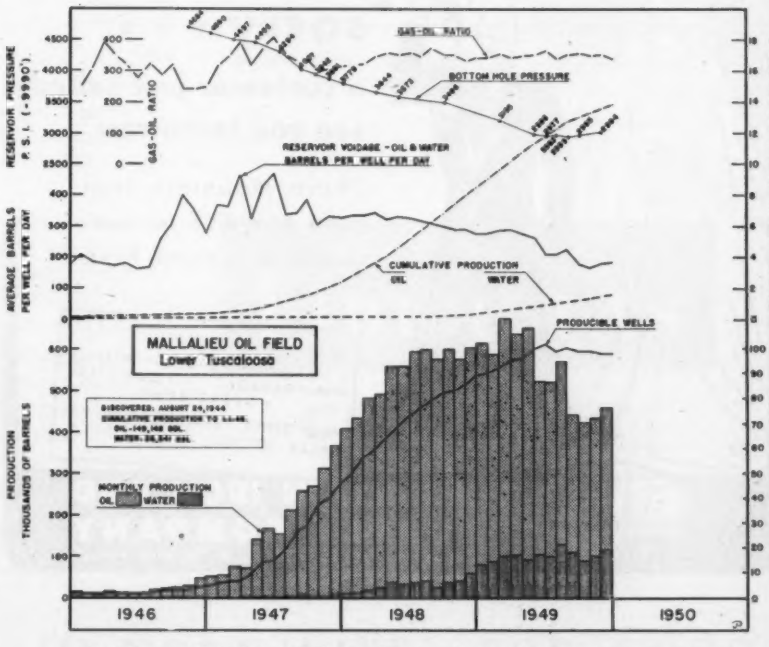
Near Soso is Sharon gas-condensate field located in Jones and Jasper counties. Discovered last fall, indications are that it will be a sizable gas reservoir. Currently there are four completed wells with another drilling. A pipe line is expected to be constructed into Sharon in the early summer.

Development of the gas reservoir in Sandy Hook and Hub fields of Marion County to date has been slow with no major pipe-line connection yet completed. Sandy Hook has four completed wells. Last December a 6-in. line was constructed into the field and currently only one of the wells is tied into this pipe line.

Hub field, located in the same county, is productive of both oil and gas condensate and has a 6-in. gas-pipe-line outlet with only one well connected. There are six wells in Hub completed in the gas-condensate reservoir.

A spacing pattern of 320 acres is set up for gas wells in the Mississippi fields.

The Transcontinental gas pipe line now under construction from Texas Gulf Coast to the eastern seaboard will cross Mississippi in the southern



Mallalieu oil field is carefully produced, using best engineering practices.

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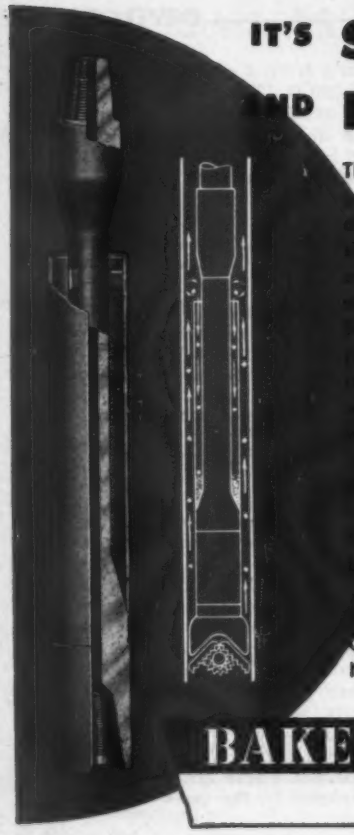

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part of the state very near to all of the above-mentioned gas fields.

A recapitulation of 1949 saw the state producing 37,885,120 bbl. of oil and condensate from 36 fields and 50 oil and gas reservoirs. This was a decrease of approximately 8,000,000 bbl. compared with 1948.

This decrease in production was brought about primarily by the severe cuts in the purchases of crude oil from low-gravity oil fields and also due in part to a further reduction in production by the establishment of allowables in several of the fields by the State Oil and Gas Board. The approximate reduction in the daily rate of oil production due to pipe-line restrictions amounted to approximately 20,000 bbl. per day, while the reduction due to the setting of field allowables in a number of the oil fields in the state amounted to approximately 11,000 bbl. per day.

Gas production during the year amounted to 108,978,452 M.c.f. which was an increase of approximately 19,000,000 M.c.f. over the previous year. This increase was due primarily to the establishment of gas outlets from several of the fields that did not previously have pipe-line connections.

Approximately 35,000,000 M.c.f. of gas was reinjected into the producing horizons in Brookhaven and Cranfield fields which are the two field-wide unitizations now in effect in Mississippi.

During the year, 349 wells were drilled for oil or gas, as compared to 426 wells drilled in 1948. The decrease in the number of wells drilled was due to a lessening in field-development drilling, the wildcat activities being essentially the same as for the previous year. In the drilling of 112 wildcats, 8 new oil or gas fields were discovered and 4 piercement-type salt domes were confirmed by drilling.

The year 1949 saw the state's five-man Oil and Gas Board presently consisting of James McClure, chairman; William H. Maynard, vice chairman; W. C. Leonard; A. B. Williams, and George M. Etheridge, Jr., making a complete study of the various oil and gas reservoirs in the state resulting in the inauguration of MER's for a number of the fields.

The big Mallalieu oil field in Lincoln County became the first oil field in the state to have daily allowables set by a state regulatory body. Productive from the lower Tuscaloosa sand at approximately 10,300 ft., the current daily allowable is 150 bbl. per well per day. The present daily average production for the field is approximately 11,000 bbl. Prior to the setting of allowables, the daily average was approximately 18,000 bbl. and the bottom-hole pressure had been declining at approximately 2.6 psi. per day for a period of 2½ years. Since the setting of allowables in

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Mallalieu field, the reduction in the rate of bottom-hole-pressure decline has been significant, and during the last 9 months the decline in pressure has been approximately 10 psi.

During the year 1949, allowables were also set in the following oil fields by the board: LeGrange and South LaGrange, Adams County; Pine Ridge, Adams County; Hub in Marion County; Heidelberg in Jasper County; Baxterville in Lamar and Marion counties.

In the early part of 1950, oil allowables were set for the following oil fields: Eucutta and Yellow Creek in Wayne County, and Brookhaven in Lincoln County.

At the present time Cranfield field in Adams County and Brookhaven field in Lincoln County are unitized and, while the Oil and Gas Board has approved the operators' unitization agreement and the royalty owners' pooling agreement for the operation of the two aforementioned fields, it has, as of this time, established the maximum efficient rate of production in Brookhaven field only.

Since the unitization of these fields, a pressure-maintenance program by gas injection has been placed in effect and, for all intents and purposes, the pressure decline in both of these fields has been completely arrested.

At the present time, approximately 76 per cent of the oil and condensate production in the state is under production control or is obtained from a unitized field operation.

During the fall of 1949, former Gov. Hugh White of Columbia resigned from the board and Gov. Fielding Wright appointed A. B. Williams of McComb to fill the vacancy. In the early spring of 1950, Walter G. Johnson, Jr., resigned from the board and Lieut. Gov. Sam Lumpkin appointed George M. Ethridge, Jr., of Meridian, to fill the vacancy.

Since the discovery of oil in Mississippi, the cumulative oil production through February 1950 is 251,735,095 bbl. Of this total 113,461,276 bbl. have been produced by Tinsley field. The current monthly production of Tinsley is approximately 450,000 bbl.

A 6 per cent severance tax on oil and condensate computed at 6 per cent of the value or 6 cents per barrel, whichever is the greater, has brought the state $20,630,039.95 since it was levied in March 1944.

The land area of Mississippi is approximately 30,348,800 acres and the productive lease area for oil and gas condensate is approximately 92,000 acres. The estimated nonproductive area under lease in the state is approximately 6,800,000 acres.

The year 1950 is the eleventh year of the establishment of Mississippi as an oil-producing state and from happenings during the first 6 months at its termination, it may well be referred to as "Lucky Eleven."

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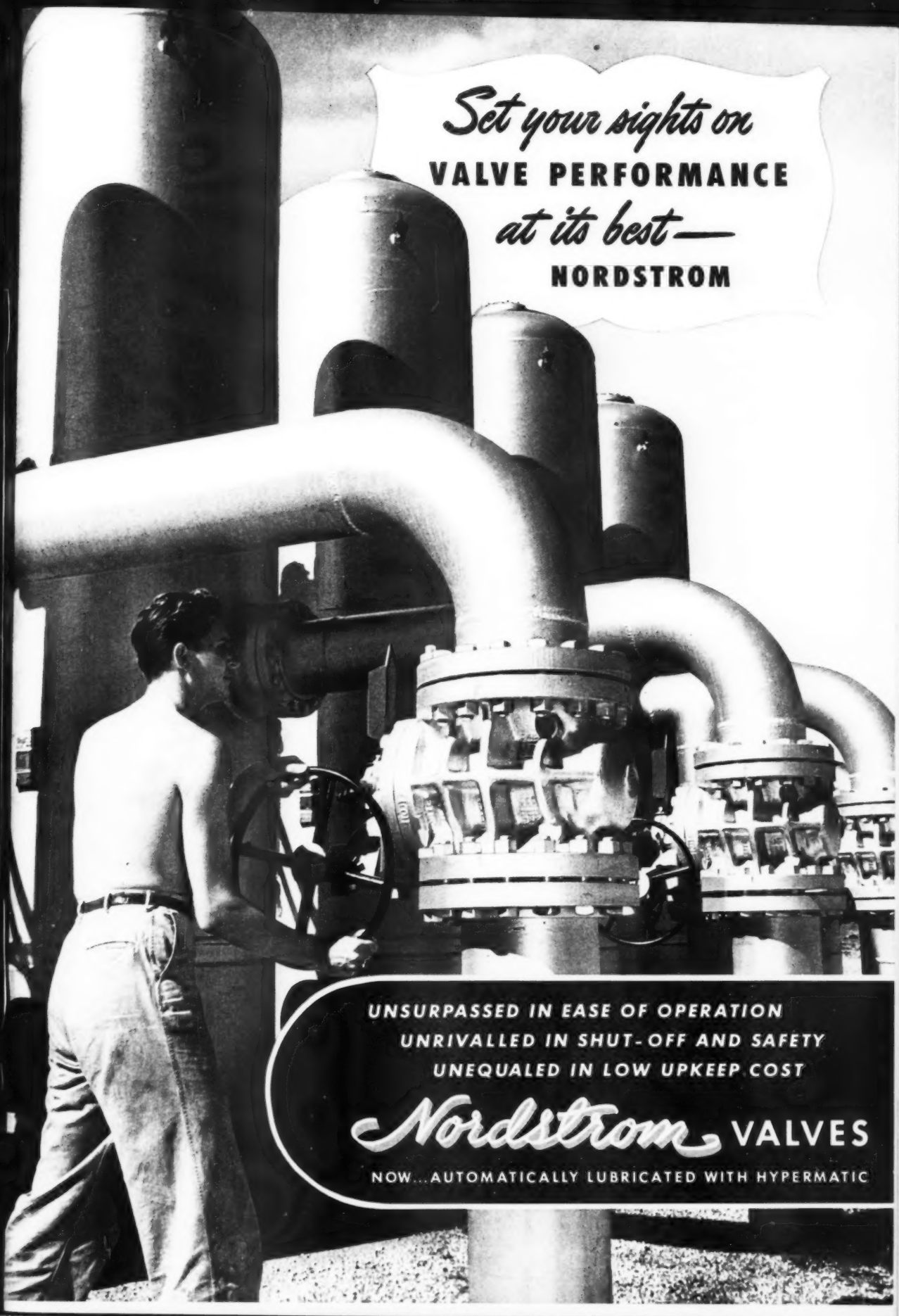
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In a recent audit of sales of Nordstrom valves extending back over a period of 20 years it was found that the ratio of repair and replacement parts was less than ½ to 100. Replacement parts were principally for valves in highly erosive services and for high temperatures where drastic conditions prevail. In other words the repair parts have over a period of 20 years equalled 46c to each $100.00 worth of valves purchased. This is indicative of the amazing low cost of upkeep as compared with other types of valves requiring frequent renewal of seating parts, packings, stems and occasional re-welds. *Nordstrom repair parts over a period of years are about one-tenth cost as compared with other valves.*

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Caddo Lake . .

Holds distinction of being the nation's first marine-drilling operation

Top: Pine Island, in Ferry Lake, which was one of the first major oil discoveries of Gulf Refining Co. of Louisiana. Notice the catwalk on piling in the foreground and the derricks resting in the marshland.

Immediately above: Believed to be the world's record pumper, Fee No. 7, just offshore in Ferry Lake (Louisiana portion of Caddo Lake), came in for 150 bbl. a day at 2,245 ft. on December 13, 1913. Up to February 1, 1950, Fee No. 7 had produced 1,009,356 bbl. and is still pumping.

Water drilling, particularly in the Gulf of Mexico, has been a subject of considerable interest the past few years. However, marine drilling is not new to the industry. Back in 1911, Gulf Oil Corp. pioneered in this field with the development of production in Caddo Lake, which straddles the Texas-Louisiana line 15 miles northwest of Shreveport. Oldtimers will read with nostalgia this discussion of the early days at Caddo Lake—wages at $3 per day, 12-hour working shifts, 20 to 25 days to set a string of casing, and production at 1,600 ft.

BACK around the turn of the century, in 1908 to be exact, W. W. Bell, an early-day lease man for Gulf Refining Co. of Louisiana, drew an assignment that was very mysterious to folks who lived around Caddo Lake at Morringsport, La.

Bell's job was to hang around Mooringsport in the vicinity of where Gulf was drilling on the Hostetter lease and keep an eye on the well. He was to flash a report to Charles Markham, first president of Gulf of Louisiana, at headquarters in Beaumont, when the well came in or proved a duster.

In those days coded signals were unknown in the oil industry, but Markham and Bell rigged up a system of their own to prevent any leak of information about the success or scope of the well.

Bell was instructed to wire Markham if the well came in that *"the pine trees grew small, tall, or very tall in this area."* The size of the trees would denote whether the well was a small one, good one, or very good one.

Bell whiled away his time around Mooringsport, carefully concealing his mission from curious residents until the day the well came in for 1,600 bbl. per day.

Taking a quick look at the spouting oil, Bell sprinted for the telegraph office. There he dashed off a hot wire to Markham which read: *"The pine trees grow very tall in this area. SHE'S FLOWING OVER THE TOP OF THE DERRICK."*

The "coded" wire caused a lot of consternation in Gulf headquarters. All the carefully contrived secrecy was ripped away by the exuberance of a born oil man when he saw a discovery well come in on the shores of the pine and cypress-studded lake.

Land men fanned out in all directions and converged on Ferry Lake, the Louisiana part of Caddo Lake. In a short time Gulf had lined up large blocks of acreage that were to result in the first marine drilling operation in the history of the oil industry.

For to Gulf Refining of Louisiana falls the honor of pioneering the first overwater drilling operations. They were the Ferry Lake wells that followed the Hostetter find by 3 years. One of these marine opera-

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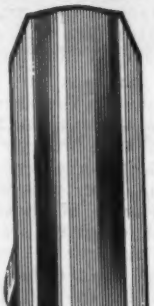
This group is a perambulating history of Gulf Refining Co.'s pioneer days in Caddo field. They are: Capt. W. C. Woolf, independent oil man of Shreveport and driller of one of the Gulf's first wells in that area; Douglas Blocker, chief of the land department in Shreveport, who ranged the whole section in a horse and buggy; Col. Joe Goodman, Gulf agent in Louisiana and with over a quarter of a century of Gulf service; W. T. (Bill) Adams, retired Gulf scout, who came to Caddo in 1911; Sam S. Caldwell, a veteran of Gulf's early days, former mayor of Shreveport and now executive vice president and secretary-treasurer, Louisiana-Arkansas division of the Mid-Continent Oil and Gas Association.

"THE NEW SCRAPER WITH THE STRONG-MAN GRIP"



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tions was 215 Ferry Lake, which produced 1,333,942 bbl. before it ran dry in 1935.

Back in those days there were no trained geologists. Geology consisted of sending out a scout who walked for miles over all kinds of terrain, seeking gas escapements, oil seepages, or water wells where the water was covered with an oily scum and seldom fit to drink.

When the scout found a spot where these conditions obtained, he sent in his report and soon a land man came along to lease the land and drilling crews followed close behind.

For years folks who lived around Caddo Lake had grumbled about their water supply. Shallow water wells gave up water that one could drink only by holding one's nose.

They had another gripe, too. Often when they went out on the lake to catch a mess of fish for supper, the lake surface would "burp" a column of water into the air and scare the fish away. These burps were gas escapements and they were of great interest to the walking geologists who came that way.

Overwater Operations Begin

By 1909, 183 wells had been completed around the lake and Gulf began to eye the waters of the lake itself. A year later the Levee Board advertised for bids on the lake and in November of that year Gulf was awarded leases covering approximately 8,000 acres for which they paid $30,000 and on which they agreed to pay $70,000 in royalties and to drill eight wells.

Under the direction of the superintendent, who was called "Admiral," Gulf moved in a fleet of 3 tug boats, 10 barges, a pile driver, and 36 small boats, and on March 3, 1911, 1 Ferry Lake was spudded in. Two months later to the day, the well blew in for 450 bbl. a day at 2,185 ft. and oil-industry history was made with the first overwater operation.

There were hazards other than

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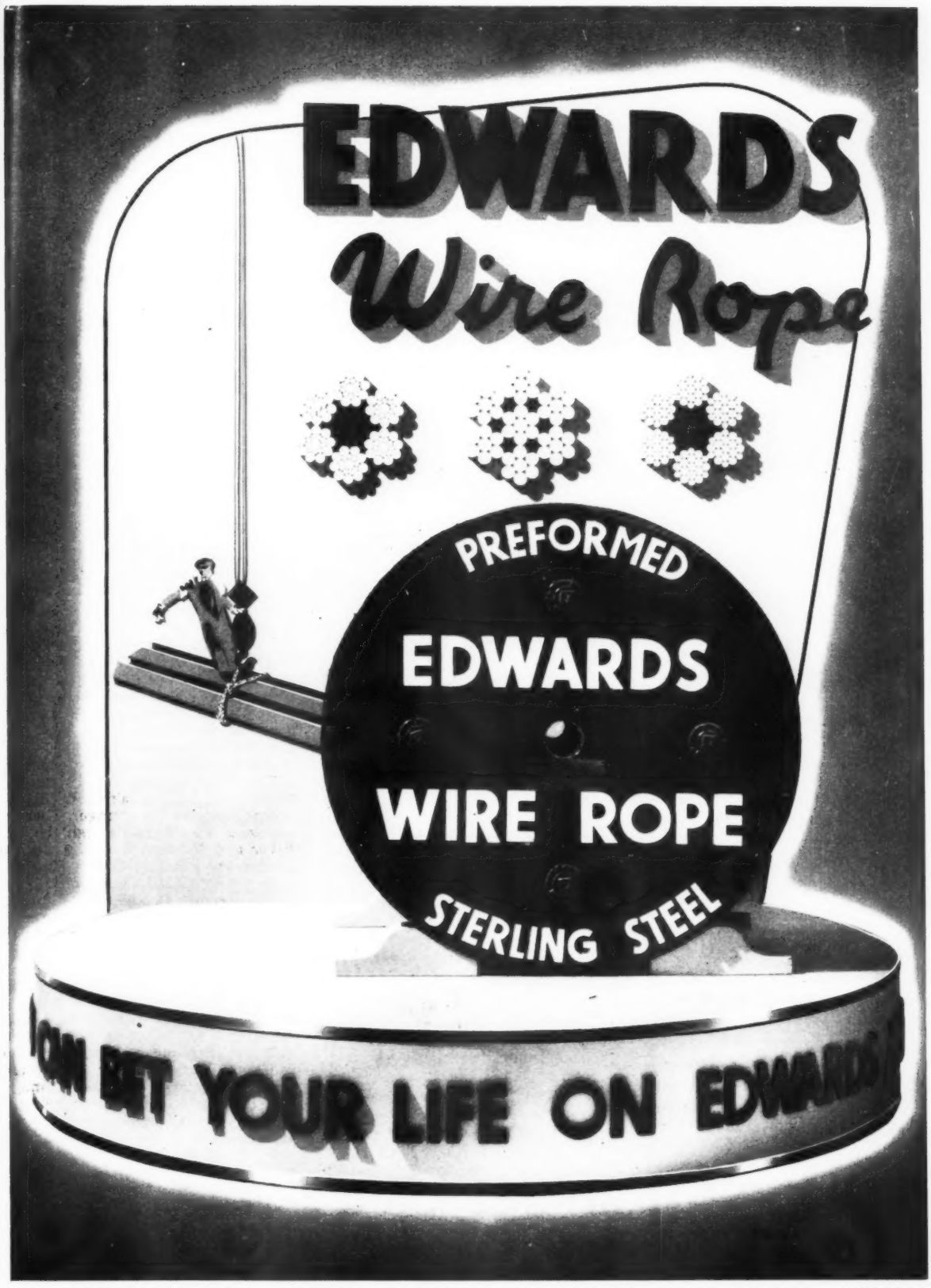

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drilling accidents and dunkings in cold water. The Caddo Lake area was pretty primitive then. A man on a lake job had to keep a wary eye out for alligators and water moccasins. He could look up now and then and see deer scamper through the timber. And back farther in the woods an occasional bear could be spotted.

Since that March day 30 years ago, Gulf has drilled 269 wells in Caddo Lake and drill bits are still seeking pay sand in the waters of the lake that was named for a wandering Indian tribe, the Caddos.

Caddo production was destined to bring another major development in drilling. When 215 Ferry Lake, the fabulous producer, came in, the drill stem was still in the hole.

The well flowed through holes in the fish-tail bit and out of this revolutionary production, some say, came the evolution of the bottom-hole choke; and, incidentally, the tubular system of drilling that is carried on today.

Caddo field has even another distinction. What is claimed as the world's top-pumper well sits just a few yards from the bank in Ferry Lake. It is 7 Fee, which was brought in on December 13, 1913, for 150 bbl. a day from depth of 2,245 ft.

Up to February 1, 1950, 7 Fee had brought up 1,009,356 bbl. of oil and the chug chug of the engine on the veteran pumper still echoes across the placid waters.

That 1 Ferry Lake was drilled in the spirit of the pioneers. Thirty-foot piling was needed on which to place the derrick. Sawing crews felled tall cypress trees on the bank, peeled them and cut them to size, and towed them out to the location.

Everything was erected on piling. Slush pits were 50-bbl. wooden tanks erected on piling. The pipe rack rested on piling. Blow boxes were pits into which were fitted log cribs, made just like a log cabin, one log resting on another. The gas blew off into the air and the oil went into the pit.

Those first marine operations were a far cry from the $1,000,000 platforms that are used far out in the Gulf of Mexico in marine drilling today.

Early-Day Costs Were Low Costs

And the spread between the costs is even further.

A Caddo Lake well could be drilled for around $15,000 and that took care of everything—the fleet, the piling, the derrick, and all.

The platform and piling cost about $1,500. Lumber could be bought for $20 a thousand then and it took around 12,000 ft. Piling cost was low because the banks of the lake were thick with virgin timber that just had to be cut and peeled. Teaming and barging costs on the platform ran $500 and the drilling equipment $1,300. There was a $10 item for nails and bolts.

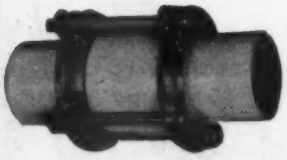
The oil was gathered in wooden tanks adjoining the lake derricks and pumped ashore for storage. There it moved down barges through the Red River and Mississippi to the Gulf of Mexico for refining, until a pipe line was laid by Gulf to join up with the Oklahoma pipe-line section at Lufkin.

It took a five-man crew to hammer down the piling, a five-man crew to build the rig, and a maintenance crew of four, and a drilling crew of five. They worked in two 12-hour shifts and the driller got $200 a month and the "hands" $3 a day. Today roustabouts get $13.76 for an 8-hour stint.

Drilling equipment was very crude in those days, a steam boiler, and crude rotary rig. And the technique was equally crude, resulting in numerous cases of stuck pipe, twistoffs, and blowouts.

W. T. (Bill) Adams, retired Gulf scout, who came to Caddo in 1911 as a scout for Sun Co. and joined up with Gulf in 1919, can tell you about them.

"Used to spud in about 10 ft. of water," Adams relates. "Only set two strings of casing, surface down to 150 ft. and the main string from there on. Working in 12-hour shifts it usually



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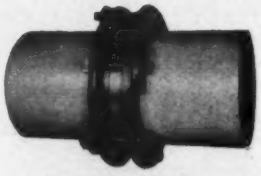

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took 20 to 25 days to set a string of casing. Now you can set a thousand feet of surface casing in a day.

"Ever so often we had to pull out the string and clean the gumbo off the fish-tail bit. They've got a fancy geological name for that gumbo now but in those days we called it plain mud.

"We only knew four sands then, too—Nacotoch, Chalk, Woodbine, and Blossom. Now the rock hounds tack a new name on every sand they find. There's about as many sands as there are fields where oil was found."

Adams recalls that when the drill bit would hit pink shale in the old days and salt water showed up, the crew just quit and moved elsewhere.

"You could load your whole equipment on two small boats and find another location. The whole drilling rig could be transported on land in a pickup truck."

Caddo field is regarded as one of the most densely drilled areas in the nation. Since it first began producing, 175,922,197 bbl. of oil have been brought to the surface.

Production in 1949 totaled 4,968,000 bbl., which is pretty close to the average figure for over 40 years.

Last year 646 wells were drilled of which 564 were completed as oil wells, 11 as gas wells, and 71 marked off as failures.

Most of this production was stripper wells, drilled to around 1,600 ft., with an average production of from 5 to 50 bbl. a day.

Since Gulf sank its first well in Caddo Lake, it has taken out 37,774,604 bbl. up to January 1, 1950. Overwater production of Gulf up to the first of the year has accounted for 23,975,739 bbl., a tidy sum for pioneering in marine operations.

Fabulous 215 Ferry Lake, which blew in for 3,930 bbl. a day through a half-inch choke on April 15, 1924, and ran dry 11 years later, was fabulous in more ways than just its terrific production.

All around the prolific producer were dry holes or wells that were so small as to be unprofitable.

The 216 Ferry Lake, 660 ft. distant, was abandoned when it made only 55 bbl. a day; 217 produced only 48 bbl. a day; 218 got but 5 bbl. but did give 3,000,000 cu. ft. of gas a day.

Earliest leases on file in Caddo Parish are dated 1901 and were made by J. M. Guffey Petroleum Co., which later became the Gulf Refining Co. of Louisiana. Their stipulations are interesting in light of provisions today.

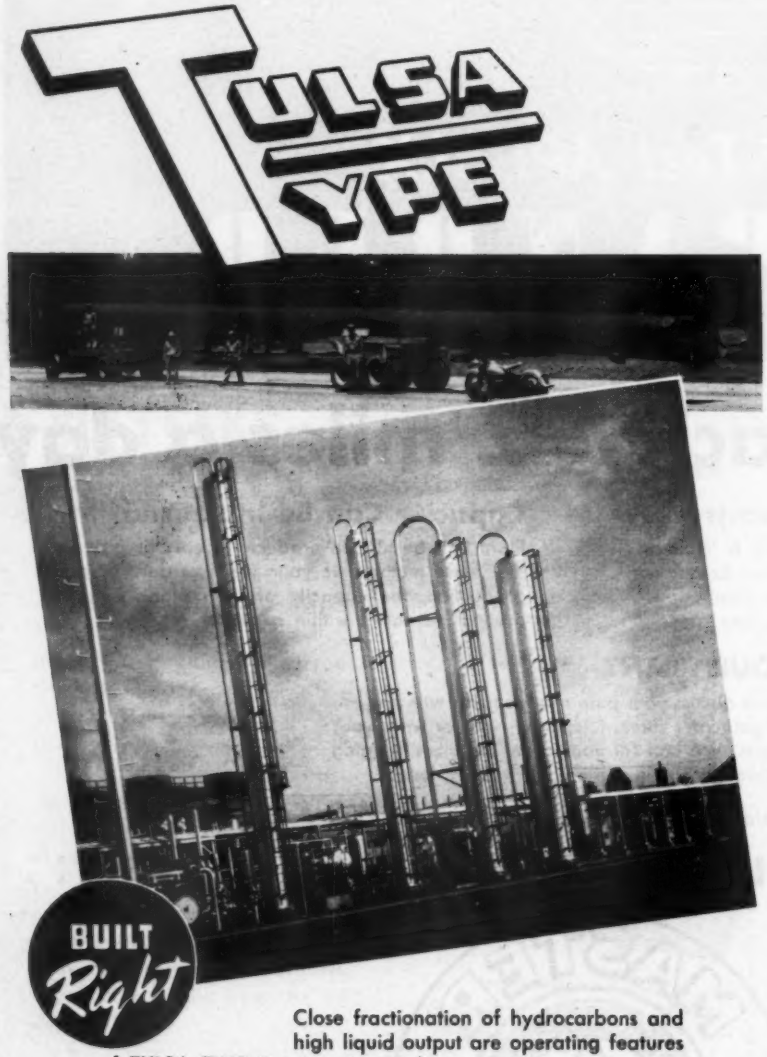
The bonus paid was $1 per contract, with annual rentals of 10 cents per acre paid in quarterly installments. The leases provided for royalty of one-tenth of the oil and $200 per year on each gas well. A surrender fee of $2 per acre was required to be paid by the lessee upon surrendering the lease. These leases carried primary terms of 25 years.

J. M. Guffey Petroleum Co. acquired leases on that basis until 1906 when bonus payments were increased to $1 per acre, rental payments upped to 50 cents an acre semiannually, royalty increased to one-eighth, primary terms reduced to periods of from 2 to 10 years, and the surrender fee increased to $100 per contract.

The first leases appearing in the name of Gulf Refining Co. of Louisiana are dated February 1909 and were acquired under substantially the same basis as the last Guffey leases.

Changes came gradually with the years until by 1920 the printed commercial lease form had eliminated the surrender fee provision and established the more or less standard royalty provision of one-eighth on both oil and gas produced, saved, and marketed, with a stipulation that until a market could be obtained on gas production, the gas royalty would be an agreed amount per well per year.

The history of Gulf Refining Co. of Louisiana goes back to December 22, 1905, when a charter was granted for primarily a sales agency. Records show that G. R. Nutty, who was sales manager in Pittsburgh, held 27 shares, C. H. Markham, first president, 1 share; J. L. James, Louisiana sales manager, 1; O. Rauchfuss, 1, and W. L. Mellon, 1.



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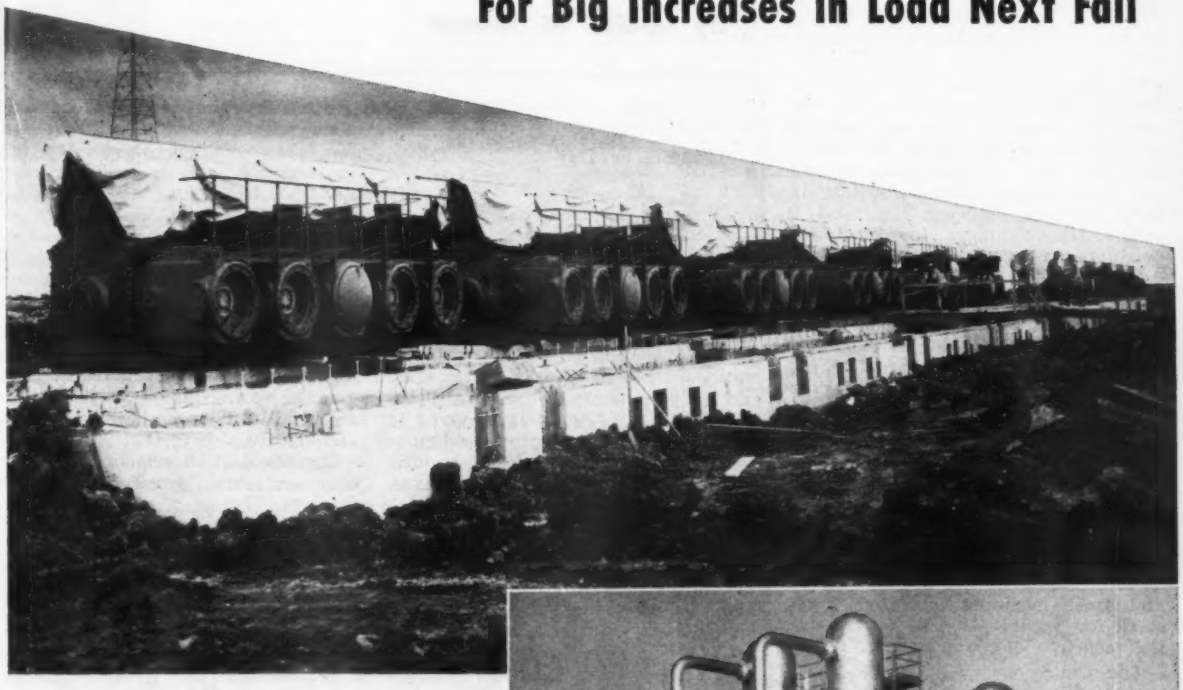
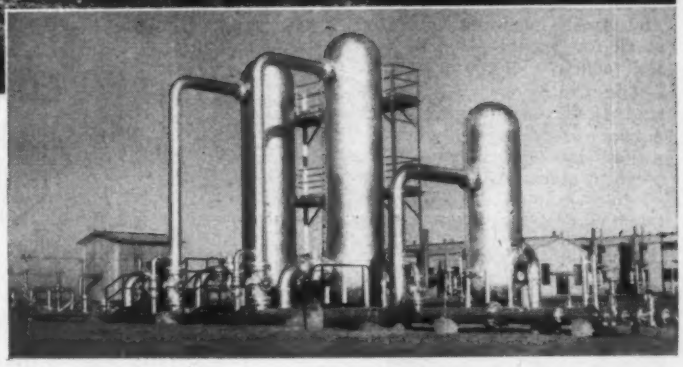


Progress under tough conditions—at a large compressor station designed and constructed by Stearns-Roger to handle gas from vacuum to 5500 p.s.i.g. thru ***five stages*** of compression. 12 separate engines in this line.



Up-to-the-minute dehydration plant on large main transmission gas line, operating at 900 p.s.i.g. A Stearns-Roger job from start to finish.

Call on STEARNS-ROGER'S wealth of experience in engineering, designing, manufacture, and construction. Specialists in *Compressor Stations*, and plants for *Natural Gasoline Extraction, Distillate Recovery, Gas Dehydration, Gas Sweetening, Sulfur Recovery*, and *Nitrogen Removal.*

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The CALIFORNIA CO.

. . . SINCE 1941

by Lucius M. Lamar

ON June 1, 1941, The California Co., engaged predominantly in exploration and production, and a wholly owned subsidiary of Standard Oil Co. of California, moved its home office from Houston to New Orleans. During the next 9 years, the company increased its production of oil from 3,700 bbl. per day in 1941 to 102,000 bbl. per day in 1949; the number of its employes from 146 in 1941 to 1,500 in 1949; and acres under lease from 294,000 in 1941 to 2,500,000 in 1949.

1941	NINE-YEAR RECORD	1949
3,700 Bbl. per Day	Oil Production	102,000 Bbl. per Day
146	Employes	1,500
294,000	Acres Under Lease	2,500,000

Can it be said, *post hoc propter hoc*, that the somewhat spectacular growth of The California Co. was caused by moving its office to New Orleans? In any literal sense, obviously not, despite certain practical advantages of the new location; but in a symbolic sense the move to New Orleans was more than a change of location. It stood for new paths and fresh pastures; for the fresh start; for the initiation of a challenging principle of management.

The California Co. was not born in 1941. It originated some 20 years earlier in Montana, whence it migrated by easy stages through the western states, to West Texas; thence to East Texas, Louisiana, and Mississippi. On the way, it went through several corporate transformations, interesting only to tax men and lawyers, since its essential identity was unchanged. It enjoyed a modest success, including participation in the discovery of prolific Yates field in Pecos County, Texas. Of greater importance for the future, was the acquisition of its personnel—almost exclusively young, vigorous men with more than the average sprinkling of potential leaders, men of outstanding character and ability.

Essentials of success in oil exploration are skill, money, and speed.

Above: Standing in front of the new multi-story California Co. Building in New Orleans are officers of the company and the parent company, Standard Oil Co. of California, San Francisco. From left to right: T. B. Flood, vice president, production, The California Co.; C. M. Tuller, vice president, sales, The California Co.; T. S. Petersen, president, Standard of California; K. H. Crandall, vice chairman of the board, The California Co.; J. W. Hoover, vice president, exploration, The California Co.; Gage Lund, vice president, Standard of California, and chairman of the board, The California Co.; Dee Davis, secretary-treasurer, The California Co.; H. C. Teasdel, president, The California Co.; H. N. Hickey, chief geologist, The California Co.

Left: Headquarters for The California Co., now nearly completed.

The Author

Lucius Mirabeau Lamar is a director, vice president, and general counsel of The California Co., at New Orleans, which company he joined in 1929. He was born in Mexico of American parents, and moved to Texas as a boy of 10. He received his academic training at Rice Institute (1920) and law training at University of Texas (1925). He practiced law at San Antonio and Dallas until he joined The California Co. in the land and lease division. He has held various positions in that division and in the legal department, which was established about 1945.

To these, modesty requires the addition of luck. Every oil man knows that a sufficiently prolonged succession of dry holes can devastate plans and arrangements otherwise perfect. In 1941, The California Co. had skilled men in all categories: workaday, technical, and managerial. It had for some years previously been short of what economists call "risk money," a lack explained primarily by the economic depression of the 1930's, especially acute in the oil industry, due to a temporary surplus of oil aboveground, of which the monstrous East Texas field was a striking and chaotic example.

Of greatest importance was the lack of speed, due not to the sloth or failure of any individual, but to overcentralized management. Before 1941, the local officials of the company were, in effect, branch managers, with responsibility for local operations, but without authority to undertake any significant new project without express approval from on high.

Everybody is familiar with the theory of this arrangement. The manager at the top level of authority is assumed, by virtue of his position, to be wiser and more competent than anyone else; ergo, his decisions are more nearly infallible. Since the top men in many cases are, in fact, as competent as they are supposed to be, this theory works very well; as to those items which reach the top men, and which reach them soon enough.

The Case of the Monolith

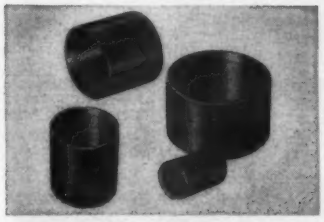
But practice often departs from theory. Take a synthetic example. A local exploration man of Monolith Oil Co. turns up a likely drilling prospect. Full of enthusiasm, he reports it to his branch manager, together with the news that potential rivals are sniffing around.

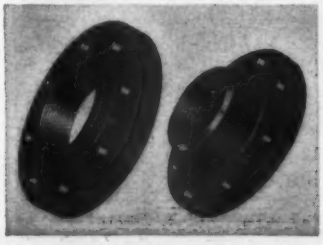
The branch manager is familiar with the entire situation and would authorize leasing; but he has no authority to do so. He tells the local rock-hound to send in a written report, which arrives in a day or two. It is quite intelligible to the branch manager, but he feels that it requires a supplement for the benefit of the home office in Centropolis. The supplement arrives in another day or two.

The branch manager forwards the whole thing, together with his own comments and recommendations, to the department manager in the home office; but the latter is too busy to give it immediate and detailed consideration. He refers it to the assistant manager, who in turn refers it down the line.

The report finally winds up on the desk of an assistant geologist, a very competent man at about the same organizational level as the field geologist who originated the proposal, but not as well informed on local conditions. He asks for additional maps, contours, and sundry data, all of which reach him in due course through the same circuituous channels. Eventually, he makes his report, which with approvals from all levels of the hierarchy, is placed upon the desk of the department manager.

To the department manager it is





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immediately obvious that the proposal is good. He approves it. The approval is transmitted through channels, clear down to the local land man, who sallies forth before dawn, armed with draft book, lease forms, and free cigars; only to discover, alas, that the land was leased 2 weeks ago by PeeWee Oil Co., a small but more agile competitor.

New Streamline Operations

The above fatal chain of circumstances was largely eliminated from The California Co.'s operations by the changes in management inaugurated in 1941. The local officials of the company were elected as its officers. They have been given full authority to run the company and disburse its funds and have been held fully responsible for results. Naturally the parent company has retained control over the purse-strings and over matters of general policy; but this control has exercised on a regional and lump-sum basis, not piecemeal. Instead of approving individual projects, as in the fictitious example recited above, the parent company has sanctioned lump-sum budgets covering entire geological regions and extending over a period of months, leaving it to local management when and where to do the work, and how to spend the money.

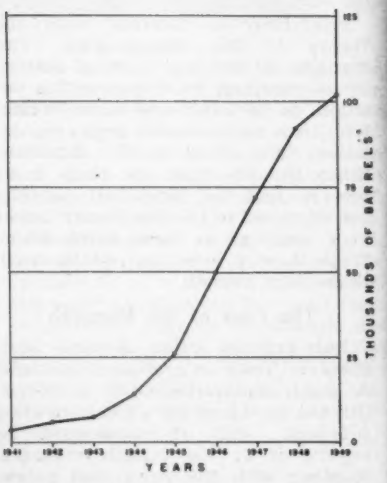
The salutary results of this arrangement have had different aspects. The California Co. has been able to combine the speed, mobility, and detailed local knowledge of a small company, with the financial resources, stability, and continuity of purpose which characterize a large company. More intimate contact between management and worker, at all levels, has served to familiarize each with the problems of the other. It has stimulated a sense of cooperation and teamwork, a sense of "belonging" to a common effort. Such attitudes are very faithful, but are difficult to maintain when "management" is not a man you know by his first name, but a remote, majestic, and impersonal title.

For his imagination and energy in initiating these measures, special credit is due to H. D. Collier, president of Standard Oil Co. of California in 1941; and for continuing them, to his successors in office, R. G. Follis and T. S. Petersen.

When The California company set up shop in New Orleans in 1941, its allotted territory was large enough to challenge even the most ambitious—embracing all the United States except Texas, New Mexico, and the Pacific Coast area. Of this, an unimpressive fraction was under lease to the company, about 294,000 acres.

Prior to the move, the company had conducted a considerable amount of exploration in South Louisiana and Mississippi, and a lesser amount in the Rocky Mountain region. The bulk of the company's production today comes from those areas.

The development of Barataria field in Jefferson Parish, Louisiana, had



Daily production of crude by The California Co., 1941 through 1949.

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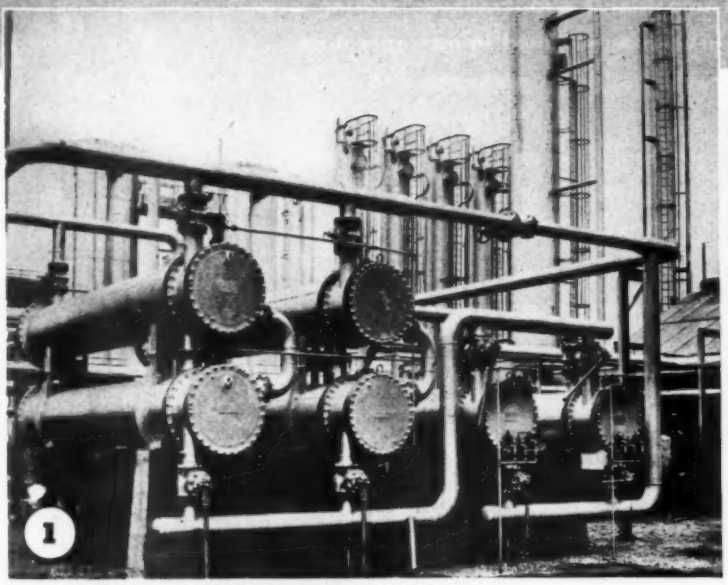

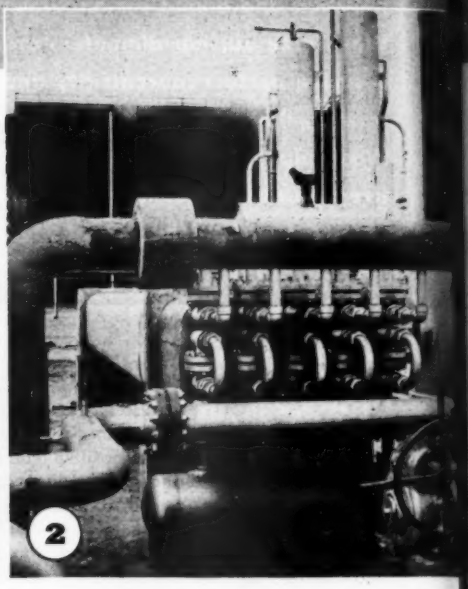

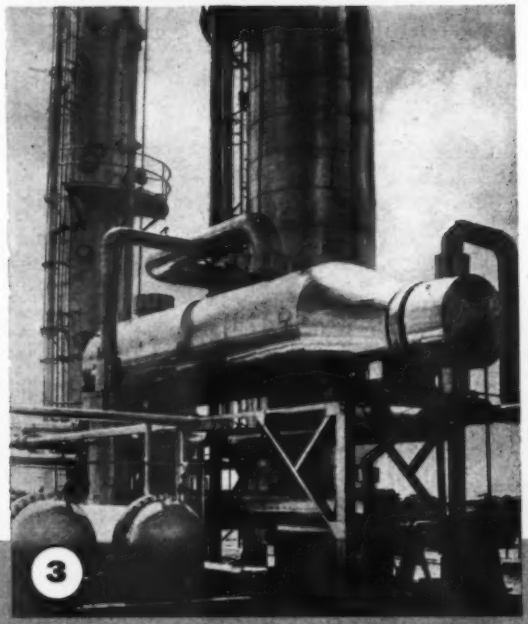

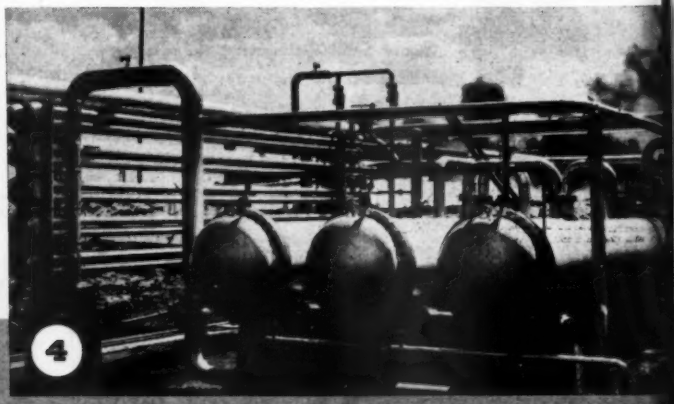

1. 6 G-R Tubular Exchangers handling glycol-amine on both shell and tube sides
2. 10 G-R Twin Bare Pipe Section Regeneration Gas Heaters
3. G-R Solution Reboiler, and G-R Tubular Secondary Exchangers
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However, the accompanying photographs, taken at random at Jal, New Mexico, indicate the wide range of services for which the Company uses G-R apparatus. The illustrated G-R units include Twin G-Fin Section Primary Exchangers, Type FST Tubular Secondary Exchangers, a G-R Solution Reboiler, and Twin Bare Pipe Regeneration Gas Heaters.

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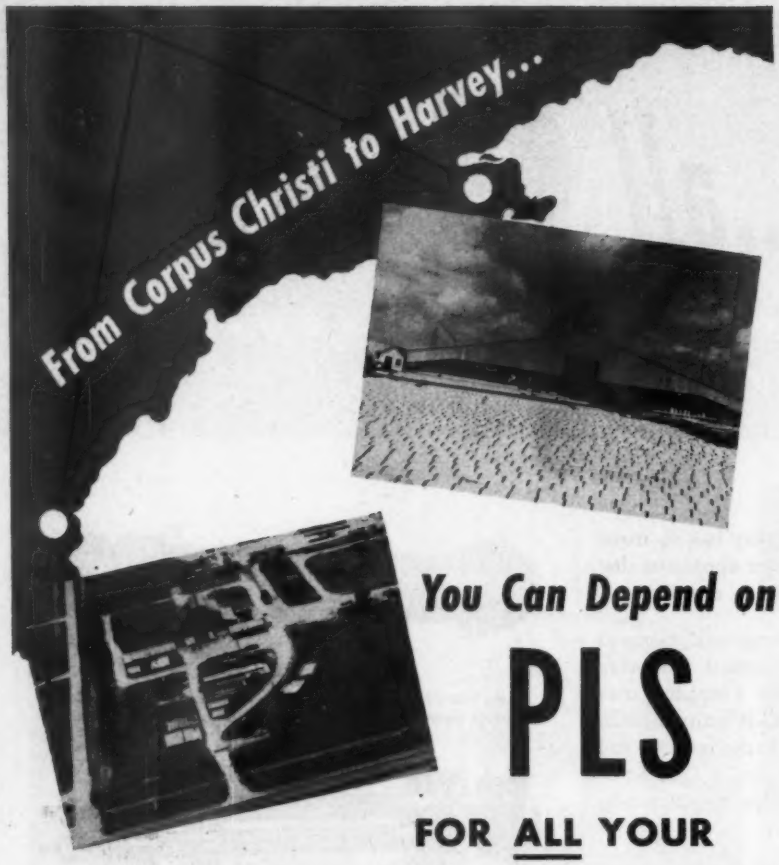

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commenced in 1939. This field today produces about 4,300 bbl. per day. In the same region were found Delta Farms field (1942)—present production 14,300 bbl. per day, Bayou Perot (1945), Bayou de Fleur (1946), Alliance (1946), and West Barataria (1947). Stella field, nearby on the Mississippi River, was discovered in 1940. Present aggregate production from the fields last mentioned is about 6,500 bbl. a day.

In Delta Farm field—one of the best fields now owned by the company, both as to quantity and quality—the discovery well was actually drilled by another company, but was not recognized as such, since it produced mostly water. The California company's geologists had for some time been casting covetous eyes at the Delta Farms structure. When it was released by the discouraged former lessee, a lease was secured by The California Co. and a producing well was completed in 1942. The field has been developed without a single dry hole. There is a mildly amusing sequel to the "dry hole" drilled and abandoned by the previous lessee. When The California Co. moved in, this well was opened up and it produced enough oil, before going completely to water, to pay for the bonus on the company's lease.

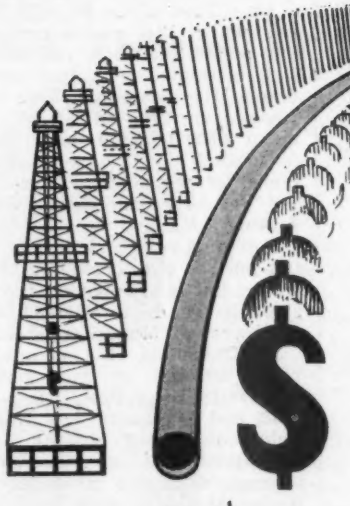
As early as 1937, the company had done reconnaissance work in Mississippi and Louisiana on what is sometimes now referred to as the Tuscaloosa trend, which was then regarded as extremely wildcat territory. This long-shot gamble paid off heavily in 1942 with the discovery of Lake St. John field in Tensas and Concordia parishes, Louisiana, followed by the Cranfield discovery in 1943 in Adams County, Mississippi, only a few miles distant.

The two fields are quite similar and very productive, each including several separate pools. The principal reservoir in the Basal Tuscaloosa formation has oil around the periphery and gas condensate in the center. The California Co. owns roughly 80 per cent of each field. When these fields were sufficiently developed for their size and characteristics to be established, plans were inaugurated for the construction of cycling plants.

Since the physical characteristics of the sands were complex and the land ownership badly broken up, the necessary legal arrangements were rather intricate and required some time to consummate. The Lake St. John plant went into operation on June 28, 1947. The Cranfield plant went into operation on August 30, 1947.

Also located in the Tuscaloosa trend are Brookhaven field, discovered in 1943; Mallalieu, discovered in 1945; Hub field, discovered in 1945 (California's first development, 1948) and Bude field, discovered by Barnsdall in 1949. The California

DERRICKS
DOLLARS
ON THE MARCH



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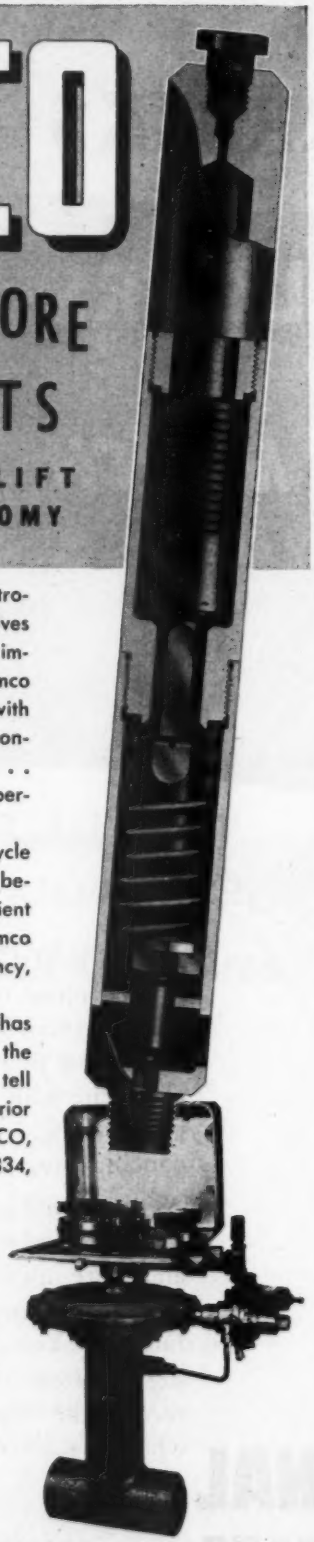

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Co. is well represented in all these fields.

In Brookhaven field, a pressure-maintenance and gasoline-extraction plant has been installed, also involving unitization of the entire field—another tedious and complex project. This plan became effective on June 1, 1948. Hub field has likewise been unitized and negotiations are in progress for unitization of Bude field. California is unit operator at Lake St. John, Brookhaven, and Cranfield.

Entirely without premeditated intent, the company found itself in the gas business by discoveries in North Louisiana: Tremont field in 1944, Hico-Knowles in 1945, and North Choudrant in 1946. A jointly owned gasoline plant has been erected and put into operation to serve these fields. The California Co. is the operator. The company's gas sales, including production from the Barataria region, are now running 86 million cubic feet per day. A substantial increase in gas sales is to be expected when the repressuring phase of operations at Lake St. John, Cranfield, and Brookhaven comes to an end.

So much has been written about offshore operations that a recital here of their romance, hazards, and triumphs would be tedious. The California Co. has taken a major part in this bold venture and has had a measure of success.

Main Pass Block 69 field was discovered in 1948 and is now producing about 2,000 bbl. per day. This field is located on a deep-seated salt dome. Bay Marchand field was discovered in 1949 and now produces about 4,600 bbl. per day. This field is located on a very shallow salt dome, of which the outer rim has not yet been completely tested by drilling. Romere Pass field, a very recent discovery and a very promising one, is not located in the open water; but is situated on the Mississippi River delta a short distance northwest of Main Pass field.

In Oklahoma, the company has about 460 bbl. of daily production in Sivell's Bend field, discovered in 1946, and Mayesville and New Hope fields, discovered in 1948.

Rangely field in Colorado is the company's largest producer in the Rocky Mountain area, with a production of 18,525 bbl. a day. This field was actually discovered in 1933, but remained in a dormant condition until 1943 because of several factors: failure to realize its full potentialities; its inaccessibility from transportation; the low price of oil; and litigation over titles. Interest was revived in 1943 and a second well was drilled in 1944, and subsequent development of the field was rapid. It was given a pipe-line outlet in 1945 by a line running to a pipe-line junction point at Wamsutter, Wyo. In November, 1948, pipeline service to Salt Lake City was

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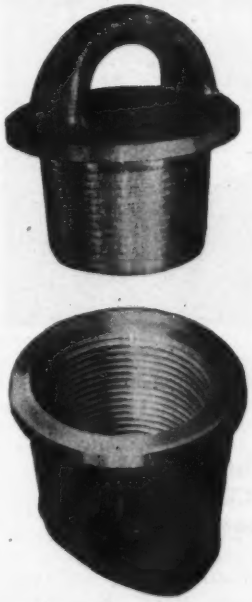

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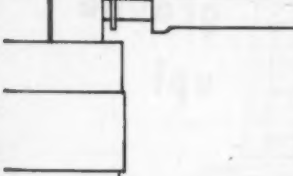

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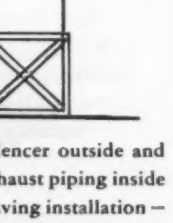

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provided by Salt Lake Pipe Line Co., another subsidiary of Standard Oil Co. of California.

Production from Wilson Creek field, Colo., discovered prior to 1941, is 3,875 bbl. a day.

Production in Wyoming from Quealy field, discovered in 1934, Medicine Bow (1935), Neiber Dome (1947), Seven-Mile, discovered in 1947, Little Laramie, discovered in 1948, and Borie, discovered in 1949, totals about 1,700 bbl. a day.

Ashley Valley in Utah, discovered in 1949, produces about 125 bbl. per day.

The California Co. "inherited" from the previous administration a sales and distribution business operating out of Denver. This has been a relatively small but usually profitable adjunct.

The foregoing discoveries were not made without cost and effort. From 1941 to date, the company has surveyed by seismograph approximately 21,000,000 acres and by gravity meter about 102,000,000 acres. During this period, some 5,000,000 acres of land were leased, of which about 2,500,000 acres are still held. Extensive exploration programs were conducted in Alabama, Georgia, Florida, Kentucky, Virginia, Arkansas, Oklahoma, and other states. A number of very deep, very expensive and very dry holes were drilled.

The effects of World War II were both beneficient and baneful. On the beneficient side, the tremendous demand for oil and its products, which made itself felt some time before the shooting began, caused investment in oil exploration to be more inviting thant it had been for many years previously. On the baneful side, the company suffered to the same extent as others from the shortage of supplies and services. It suffered most acutely from the shortage of manpower. Its most rapid expansion, its greatest need for new men of high quality, took place at a time when many of the most desirable young men were in military or government service.

Needless to say, the operations we have mentioned were very costly and the project as a whole remained "in the red" until a rather recent date. That it was carried through to its present affluent condition, is a tribute to the faith and courage of the men who controlled the purse-strings and the men who conducted the operations.

Present officers of The California Co. are: board chairman, Gage Lund; board vice chairman, K. H. Crandall; president, H. C. Teasdel; vice president, production, T. B. Flood; vice production, exploration J. W. Hoover; vice president, sales, C. M. Tuller; secretary-treasurer, Dee Davis; and vice president and general counsel, L. M. Lamar. Lund was president of the company from 1941-1945; Crandall, from 1945-1947.

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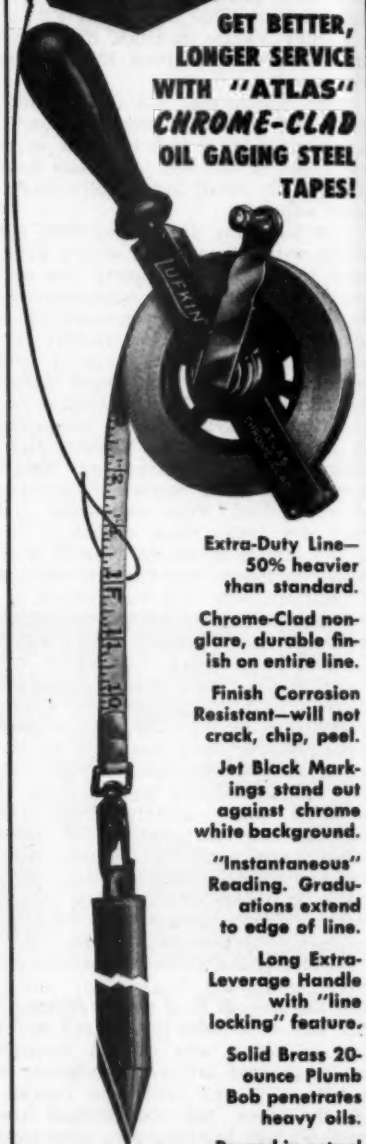

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Research Activity

(Continued from page 187)

The early research work in the Gulf Coast area has been done primarily by major oil companies. The importance of research to the oil companies has long been recognized and major companies have large research organizations to serve their various operations. The general policy of the major oil companies has, until recently, been towards the concentration of their research activities at a particular locality, and generally in the industrial East. A major part of the research activities of the oil companies has been in the end product and in general has been carried on close to the major marketing area.

In the case of the major companies, decentralization in some phases will undoubtedly take place. Recognition of research as an important tool in connection with daily plant and field operations requires that research facilities be available in operating as well as marketing areas. An important part of the value of research is in its byproducts which are often of an educational value. One advantage in having the research done in close proximity to where the information will be used in the acquainting of more people with all of the factors which are involved. Recognition of the advantage or need of having the research done in the region is reflected in the number of major companies that have set up local laboratories for handling problems in production and exploration in the past few years.

Cooperative Research

One of the important developments in connection with research in the oil industry during the past decade has been in the development of cooperative research. Common-denominator type of problems which cut across company lines and which are concerned with the collection of basic information fall into this general field. The collaboration on the collection of basic information keeps down the cost of the general studies and permits carrying the work to a greater degree of completion.

The spending of $25,000 or $50,000 per year by a single company on some of the major problems does not advance the art very rapidly. If a number of companies are doing this, none of them makes much progress and they will essentially be duplicating their efforts. If, however, a number of these companies collectively contribute to an over-all program, the program can be carried out on a scale to give a very complete coverage of the basic problem. Once the basic information is collected, each of the companies can then work independently on the application of this basic information to its particular problem and its competitive advantage can still be maintained.

This type of approach, which has been carried out in some of the A.P.I. projects, by drilling contractors on their drill-pipe research, by Drilling Research, Inc., and by the Offshore Operators' Committee, has permitted the undertaking of some rather fundamental and general programs of a nature which could not be justified by any individual company.

Another type of cooperative research development is that represented by the Texas Petroleum Research Committee. This committee has as its objective the increasing of ultimate recovery of the state's petroleum resources. Research is being planned in the field of secondary recovery at A. & M. College of Texas and University of Texas. The financial support of this program comes from a state tax on oil production.

Some of the oil-company laboratory facilities which are concentrated in this area include Humble Oil & Refining Co., which is concerned with research problems relating to exploration, production, new product development, and pipe-line research; The Texas Co., whose laboratory is primarily concerned with production research; Sun Oil Co., which has extensive laboratories in the field of exploration; Gulf Oil Corp., whose laboratories are primarily concerned with exploration with some production work; Warren Petroleum Corp., whose laboratories are primarily con-

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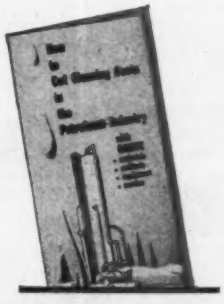

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cerned with problems related to natural gasoline and natural gas products, to mention a few larger units.

In general, the laboratories which have been established have been concerned with the problems of the large oil interests. However, a number of the industrial companies have developed research divisions of considerable size. Such companies as Hughes Tool Co. and Reed Roller Bit Co. have extensive research facilities for developing new products. Other companies maintain laboratories for handling customer problems, new developments, and process improvement. These include the various private exploration companies, for example, which are concerned primarily with developing specialized equipment and new methods.

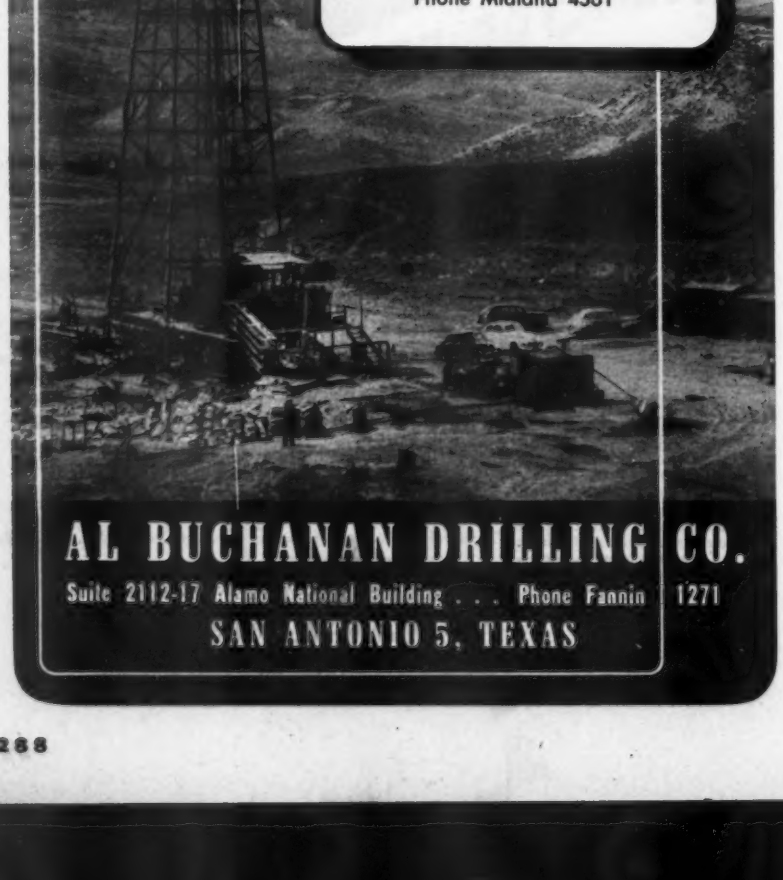
There are also available in this region a number of independent research laboratories that have facilities which can be utilized by large as well as small companies. In many cases the major companies have problems which require the use of specialized equipment or personnel and are using some of their facilities on special problems. These facilities can also be used by the small companies for handling special or basic problems.

Southwest Research Institute, San Antonio and Houston, is the one nonprofit independent industrial research facility in this area. Southwest Research Institute was set up to provide in this region, a research facility available to large and small companies for the handling of their research projects on a nonprofit contract basis. In addition to the conventional type of organization, Southwest Research has set up four divisions in which it expects to develop unusually extensive facilities for both regional and national use. These include a division of oceanography and meteorology, to work primarily in the Gulf of Mexico area; a division of petroleum technology to be concerned primarily with problems relative to the petroleum industry; a division of fire technology to be concerned with problems of eliminating and controlling fire hazards; and a division of housing technology to work in this important field with primary emphasis on development of quality housing.

One of the outstanding facilities which Southwest Research Institute has developed in its short time of operation is a fully equipped laboratory for the evaluation of fuels and lubricants. Southwest Research Institute's laboratories for this purpose are located in San Antonio. They are equipped to carry out all types of engine, fuels, and lubricant evaluation in the laboratory and on road tests. These facilities have been used by oil and accessory companies from all parts of the United States and fleet tests have been conducted for a number of the major companies. These facilities are being expanded to include the evaluation of various automotive components, and as such, will undoubtedly reflect in better coordination between the automotive equipment manufacturers and the oil companies. Through an independent research organization such as Southwest, these groups have a common basis for getting together.

The extent to which research is expanding on the Gulf Coast can be seen from the fact that Southwest Research Institute in its second year of operation did a half-million-dollar volume.

The universities of the Gulf Coast area have likewise developed research facilities in many science fields. University of Texas has extensive research under way for various governmental agencies and industrial concerns. It has an off-campus research center which acts as a coordinating agency for many of the research laboratory units of the university. Among other facilities, University of Texas has a marine laboratory at Port Aransas. The Texas A. & M. Research Foundation is a nonprofit corporation which makes available to industry certain facilities of the Texas A. & M. College system. It also has in progress a wide variety of projects for governmental agencies and industry. It maintains a marine laboratory in Louisiana.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Louisiana's Outlook Bright

Prospects Good for Continued High Rate of Exploration

by T. M. Winfiele*

GOOD EXPLORATION TERRITORY

Louisiana is good exploration territory for finding oil. Last year 42 new oil and gas fields were opened. There was a total of 232 wildcat wells drilled and therefore there was one new field discovered for each 5.5 wildcat wells. This is a productive completion of 18 per cent.

In addition to the new fields discovered there were many extensions of the proven productive areas of old fields, and new productive reservoirs discovered in known productive areas.

Since there were 1,788 wells completed as producing wells and 2,251 wells completed over-all, this shows in 1949 that 79.4 per cent of all wells completed were productive. Of these productive wells completed 78.9 per cent were oil wells and 21.1 per cent were gas and/or gas-condensate wells.

THE outlook for a good year, with many new field discoveries and extensions of old fields in Louisiana, is already apparent for 1950. The discussion to follow will outline the progress made by the oil and gas industry in the South Louisiana or Gulf Coast region during 1949. This outline will then serve as a background to form a base for the conclusion that Louisiana's Gulf Coast area rests on a strong foundation of oil and gas reserves.

Approximately 70 per cent of Louisiana's production of liquid hydrocarbons, which includes both crude and condensate, is produced in South Louisiana. Louisiana produced 197,877,129 bbl. of liquid hydrocarbons for 1949, of which 149,647,345 bbl. were produced in the Gulf Coast region. The 1949 crude and condensate production surpassed by 10 million the 1948 figure of 187,109,800 bbl.

South Louisiana during 1949 produced 493,869,198 M.c.f. of natural and casing-head gas, or approximately 50 per cent of the total of 1,025,474,930 M.c.f. produced in the entire state.

Drilling activity during 1949 was at a continued high rate, with 1,006 wells drilled, of which 598 were completed as oil producers, 64 as gas producers, and 344 completed as dry holes, giving a very high producing completion ratio of better than 65 per cent.

There were 5,096 wells at the close of 1949 producing in South Louisiana. Making up this total were 2,797 flowing oil wells, 1,529 oil wells producing by artificial lift, and 770 gas wells.

*Chief engineer, Louisiana State Department of Conservation. The geological information found in this report has been furnished by Leo W. Hough, state geologist.

Results by Operating Areas

South Louisiana is divided, for administration purposes, into four districts. A tabulation of the completions for 1949 by districts and the number of rigs active at end of year follows:

	Type of well completed in 1949			No. rigs
District—	Oil	Gas	Dry	running
Houma	157	24	100	53
Lafayette	198	10	105	44
Lake Charles	103	20	74	39
New Orleans	140	10	65	34
Total	598	64	344	170

For the same interval of time in South Louisiana, 34 new fields were discovered, 15 of which were oil fields, 4 gas fields, and 15 gas-condensate fields. Thirteen of the new discoveries were in the Gulf of Mexico, which is indicative of the great amount of exploration being conducted in the gulf areas. Table 1 is a tabulation of the 34 discoveries for 1949.

Important Discoveries

Bay Marchand field.—This possibly is the most important discovery in 1949 in South Louisiana. Located on the coast of Lafourche Parish, the discovery well was completed by The California Co. in March, producing at the rate of 250 bbl. of oil and 143 M.c.f. of gas per day through a ¼-in. choke. During the year, 10 producers were completed. Production is from shallow, upper Miocene sands ranging from 2,800 to 5,200 ft. in depth.

The field is developed on one of the largest piercement-type salt dome structures yet found. It underlies an area roughly 4 miles in diameter, partly on shore and partly in the gulf. Strangely enough, as far back as 1927, the dome had been discovered by seismograph surveys. In 1930, the first test well was drilled, with one gas well resulting up to the time of The California Co.'s discovery.

Lease of the offshore area was obtained by The California Co. in 1948 for approximately $1,000,000.

DeQuincy pool.—In November of 1949, Niloco Co. drilled and completed the 2 Industrial Co. well, which well first established production in this new Calcasieu Parish pool. Initial production was 240 bbl. of oil and 105 M.c.f. of gas per day through 10/64-in. choke. Production is from an interval of 6,654-66 ft. in a lower Miocene formation.

The DeQuincy structure appears to be a closure on the downthrown block of a fault. Since the drilling of the discovery well, eight producers have been completed, extending production ¼ mile north, south, east and west.

Duck Lake field.—Humble Oil & Refining Co. drilled the Atchafalaya Land Co. et al Unit well No. 1, and upon completion in January 1949, established the new discovery in St. Martin Parish. The well produced 273 bbl. of 36°-gravity oil and 205 M.c.f. of gas per day on a 12/64-in. choke from perforations at 11,642-52 ft. During the year four producers were completed, three of them in different sands.

Production is from Miocene sands ranging in depth from 11,642 to 12,407 ft. At the end of the year, the field limits had been extended ¾ mile south and 1 mile west. A study of field electrical logs indicates about 14 producible sands in the field.

East Longville field.—The discovery well, Barnsdall 1 M. Jones, was completed May 17, 1949, and produced initially 309 bbl. of 47.2°-gravity oil per day on a 10/64-in. choke. Subsequent activity during the year extended production ¼ mile to the east, west and north.

Structurally, the field expresses itself as an east-west anticline, resulting from a closure on the downthrown side of an east-west trending fault. Production is from a Cockfield

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New Discoveries in South (Gulf Coast) Louisiana—1949

Field and parish—	Operator, lease and well number	Location	Total depth (ft.)	Production depth (ft.)	Prod. rate, daily		Choke	Gravity	Geological age
					Bbl.	M.c.f.			
1. Avondale, Jefferson	Humble 1 Texas & N.O.R.R.	26-13s-22e	10,129	8,183-88	130	168	18/64	31.0	Miocene
2. Bay Marchand, Lafourche	Cal. Co. State Lease 1366-B-1	Gulf	3,721	2,873-92	250	143	1/4	26.6	Miocene
3. Bayou Plaquemines, Iberville	Callery & Hurt 1 Repp	79-9s-11e	12,366	10,809-36	34	1,500	9/64	....	Miocene
4. Black Bay, Plaquemines	Gulf 2 State Lease 195 "QQ"	17s-17e	11,673	10,095-10,102	865	5,400	1/4	54.2	Miocene
5. Breton Sound area, Block 32, Plaquemines	Barnsdall 5 State Lease 1237	Gulf	9,022	5,809-12	187	40	14/64	25.1	Miocene
6. Burton, St. James	Humble 2 Burton Swartz Land Corp.	51-12s-15e	11,450	10,819-25	260	4,374	1/4	52.0	Miocene
7. DeQuincy, Calcasieu	Nilloco Co. 2 Ind. Lbr. Co.	2-8s-11w	6,750	6,654-64	239	105	10/64	29.5	Miocene
8. Duck Lake, St. Martin	Humble-Atchafalaya Land Co. et al 1 Unit	11-15s-11e	12,525	11,642-52	273	205	12/64	36.2	Miocene
9. Duralde, Evangeline	Richardson & Bass (La. Account) 1 Ada M. Soileau	31-5s-2w	12,835	11,294-11,336	85	445	1/8	44.1	Cane River
10. East Longville, Beauregard	Barnsdall 1 M. Jones	3-6s-9w	8,355	8,320-36	309	500	10/64	47.2	Cockfield
11. Eugene Island, Block 32, St. Mary	Pure A-1 State Lease 832	Gulf	12,425	9,620-28	198	146	13/64	37.0	Miocene
12. Eunice, Acadia	P. A. Ward Co. 1 W. B. Vincent	14-7s-1w	4,065	3,681-86	75	None	10/64	24.5	Miocene
13. Lake Raccourci, Lafourche	Humble 1 State Lease 1450	Lake	14,650	9,846-49	163	679	1/8	57.5	Miocene
14. Mallard Bay, Cameron	Gen. Am. of Texas 1 A. F. White	14-13s-3w	10,642	3,912-33	144	1	7/64	39.7	Miocene
15. Manila Village, Jefferson	Tide Water 1 State Lease 1299	35-18s-24e	13,050	12,944-13,050	157	864	6/64	39.0	Miocene
16. Midland, Acadia	Sun-Sohio 3 Lapleau Est.	49-10s-2w	11,850	10,618-30	134	2,153	1/8	42.5	Miocene
17. North Bancroft, Beauregard	Atlantic Refining Co. A-1 Sabine River Lbr. Co.	24-5s-13w	9,586	9,304-24	230	81	10/64	39.6	Wilcox
18. North Welsh, Jefferson Davis	Continental 1 R. A. Estes	11-9s-5w	11,474	11,263-69	168	4,800	11/64	44.0	Miocene
19. Outside Island, Vermilion	Hunt 1 Broussard	6-14s-1e	12,636	12,098-12,106	70	1,667	11/64	42.7	Miocene
20. Ship Shoal area, Block 28, Terrebonne	Kerr-McGee A-1 State Lease 750	Gulf	14,451	8,482-90	24	1,185	11/64	55.0	Miocene
21. South Arnaudville, St. Martin	The Union Sulphur Co. 1 Hefea Land Co.	39-8s-5e	11,900	11,039-78	50	3,400	16/64	44.8	....
22. South Tigre Lagoon, Iberia	Union Oil Co. of California 1 State Lease 1700	14s-5e	11,822	11,400-15	29	1,650	1/8	....	Miocene
23. South Timbalier area, Block 34, Terrebonne	Humble A-1 State Lease 1027	Gulf	9,928	9,550-58	173	7	1/8	39.6	Miocene
24. Springville, Livingston	Danciger 1 M. E. Smiley	9-7s-5e	8,747	8,065-75	109	75	6/64	43.5	Miocene
25. Turtle Bayou, Terrebonne	Shell 1 Continental Land & Fur Co.	32-17s-14e	12,002	11,980-88	65	2,750	12/64	47.5	Miocene
26. Vermilion area, Block 39, Vermilion	Pure A-3 State Lease 880	Gulf	10,379	8,195-8,220	10	909	....	52.6	Miocene
27. Vermilion area, Block 76, Vermilion	Superior C-1 State Lease 1106	Gulf	11,603	7,415-30	4	2,022	11/64	46.5	Miocene
28. West Cameron area, Block 33, Cameron	Phillips A-1 State Lease 1123	Gulf	13,282	10,390-10,410	414	428	1/4	42.3	Miocene
29. West Cameron area, Block 45, Cameron	Stanolind A-1 State Lease 1133	Gulf	8,814	8,738-48	40	3,590	11/64	51.5	Miocene
30. West Cameron area, Block 149, Cameron	Superior A-1 State Lease 1164	Gulf	9,380	5,798-5,834	14	....	24/64	43.5	Miocene
31. West Delta area, Block 27, Plaquemines	Humble A-3 State Lease 818	Gulf	11,122	9,473-80	11	811	1/8	48.8	Miocene
32. West Delta area, Block 30, Plaquemines	Humble A-1 State Lease 819	Gulf	7,500	2,170-79	0	0	1/16	28.2	Miocene
33. Lake Sand, Iberia	Humble 1 State Lease 1706 West Cote Blanche Bay	Bay	13,693	10,005-10	36	....	16/64	....	Miocene
34. Eugene Island, Block 110, Iberia	Magnolia A-1 State Lease 666	Gulf	12,048	9,970-72	30	....	11/64	....	Miocene

sand of the Claiborne group encountered at about 8,350 ft.

Oil and Gas Reserves

Louisiana's crude-oil reserves (December 31, 1949) are estimated as 1,909,769,000 bbl., or an increase of 40,479,000 bbl. over the estimated reserves of crude oil of 1,869,290,000 bbl. at the close of 1948.

Louisiana's estimated proved reserves of natural-gas liquids as of the close of 1949 is 596,422,000 bbl., which indicates an increase of 72,326,000 bbl. over the estimated reserves of 524,096,000 bbl. as of December 31, 1948.

Estimated proven natural-gas reserves for Louisiana at the close of 1949 was 26,687,811 million cubic feet as compared to 23,977,520 million cubic feet for a year previous.

Offshore (Tidelands) Activity

Much has been said and written about the tidelands or offshore drilling off the coast of Louisiana in the Gulf of Mexico. Since Kerr-McGee Oil Industries completed the first offshore discovery well in the Ship Shoal area, Block 32 field, off Terrebonne Parish, many millions of dollars have been expended in search of new reserves. It has been estimated that the oil industry is spending $60,000,000 per year in the offshore exploration and development along the Louisiana and Texas coasts.

During 1948, the Department of Conservation issued 37 permits to drill off the shores of eight Louisiana parishes. Eighteen wells were completed, of which 13 were producing wells and 5 completed as dry holes. Of the producers, seven were oil and six were gas wells. At the close of 1948, there were 16 rigs running on offshore locations. Seven new fields resulted from these activities.

This past year, 1949, showed a marked increase in activity, Seventy-nine drilling permits were issued and 69 wells completed. Thirty-nine were productive wells, of which 29 were oil and 10 were gas wells. Thirteen new fields resulted from these activities.

BOOKS

CORN AS A RAW MATERIAL FOR ETHYL ALCOHOL. By L. K. Arnold and L. A. Kremer. Bulletin 167 of Iowa Engineering Experiment Station, Iowa State College, Ames. 103 pp.

This bulletin discusses manufacturing processes, estimated production costs, future remand, possible new markets, future supply, and subsidization of corn alcohol. While an accurate forecast of the future of an industry affected by as many economic and technical variables as the corn-alcohol industry is impossible, an attempt is made in this bulletin to analyze the various factors which will affect the future of the industry and to present them with such conclusions as seem warranted.

Sun's Seadrome

(Continued from page 193)

It is obvious that in ocean depths of 32 ft. or less, putting the rig on the bottom is simply a matter of flooding the bottom spud tanks and then dewatering them when it is desired to refloat the rig.

For depths in excess of 32 ft., the procedure is somewhat different. As an example of this procedure, it can be assumed that the rig has been towed to the proposed well site at which point the water is 50 ft. deep. The maneuvering lines with their connected anchors are set so as to maintain the rig at the selected location. The draft of the rig may be selected at random as long as it is approximately 10 ft. less than the depth of the ocean.

The contemplated draft is about 22 ft. with the spud tanks completely retracted. This draft was selected as insuring stability and easy towing.

With the structure adequately anchored, the foundation-column tanks are forced down individually or collectively by the jack system. The downward movement of the foundation columns obviously increases their displacement and unless compensated for by additional flooding of the foundation tanks would tend to float the structure at a lower water line so when founding the rig the flooding of the foundation tank system is regulated so as to maintain the structure level and at the selected water line of 33 ft. below the main deck. When the bottom of the spuds are approximately 5 ft. from the ocean bottom, the jack system is locked and the flooding of the spud tanks continued so that the structure as a whole sinks and rests on the bottom with the main deck 28 ft. above the surface of the ocean.

To compensate for irregularities of the bottom, final adjustment of the jack system can be used to give a uniform distribution of the deck load on the foundation-column tanks. The bottom jets may also be used, if necessary, to provide a level bottom to help insure this desirable condition.

Self Docking

The Sun-Seadrome is designed to have a plurality of buoyancy and foundation units, in order to reduce to a minimum the forces of the wind and sea. In the preferred design eight units are used, arranged in two rows with four units in each row.

After the selection of a suitable site, having a reasonably level ocean bottom and a depth of approximately 20 ft., the rig would be maneuvered into place and brought to the foundation condition, resting on all eight foundation tanks. The main deck would then be raised by the jack system to clear the ocean surface about 30 ft. (Note: At this point, any one of the eight foundation tanks which it may be desired to inspect or repair, either inside or outside, can be raised to clear the water surface, 10 ft., more or less, as may be desirable).

Jack Operation

For raising, holding, or lowering the deck structure (and its attached buoyancy tanks, with relation to the surface of the ocean, so as to give the desired clearance between the deck and the water), oil-operated hydraulic jacks are used, four lifting jacks, spaced 90° apart around the top of each buoyancy tank and four holding jacks, or dogs, of relatively very short stroke. (One-tenth size models of the jacks have been built and tested). The purpose of these short-stroke jacks is to hold the load which is distributed uniformly by the hydraulic principle, so that each jack carries the same load. The lifting-jacks operate in the same way.

The lifting-jack piston-rod ends are pin-connected to lug extensions on the buoyancy tanks while the jack cylinder end, through the medium of an equalizing pin connected head, meshes with a dual ladder-type rack member attached to the side of the foundation tank column.

Four of these dual racks are used, 90° apart, with openings for the jack head spaced a pitch distance apart of 2 ft. 6 in. Raising or lowering the

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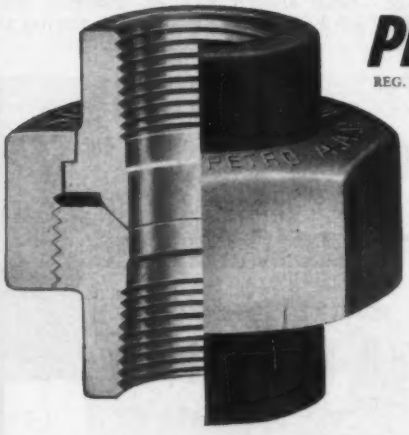

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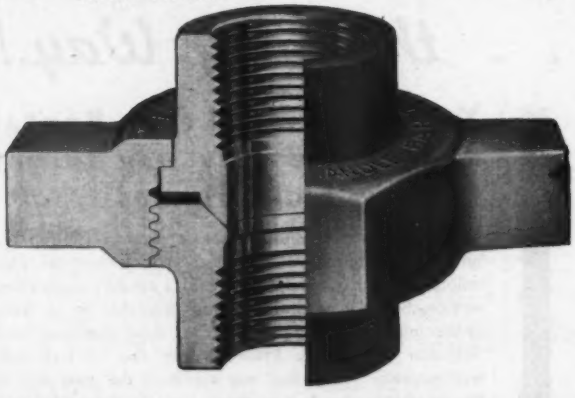

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Jet Maneuvered

The exact positioning of an offshore rig over a well, or well site, is necessary before it can be founded on the ocean bottom. While an exact location may not be required when starting a well, after drilling is finished, withdrawing the rig from the site must be done under close control. To control this operation, two double-drum winches are provided, located on either side of the main deck at the center. Wire lines from which the winch drums, through the medium of corner fairleads and terminal anchors, make it possible when the rig is free-floating to maneuver it under exact control and, when desired location is attained, flooding of the foundation tanks will bring the structure quickly to the founded conditions.

Another function of the ballast pumping equipment is to provide high-pressure water to a series of eight fan-like radial jets, located in the bottom of the foundation columns. Purpose of these jets is to break contact of the tank bottoms from the ocean bed. Under some conditions they might become attached so forcefully by the so-called suction effect as to make release from the bottom very difficult.

Storage Capacity

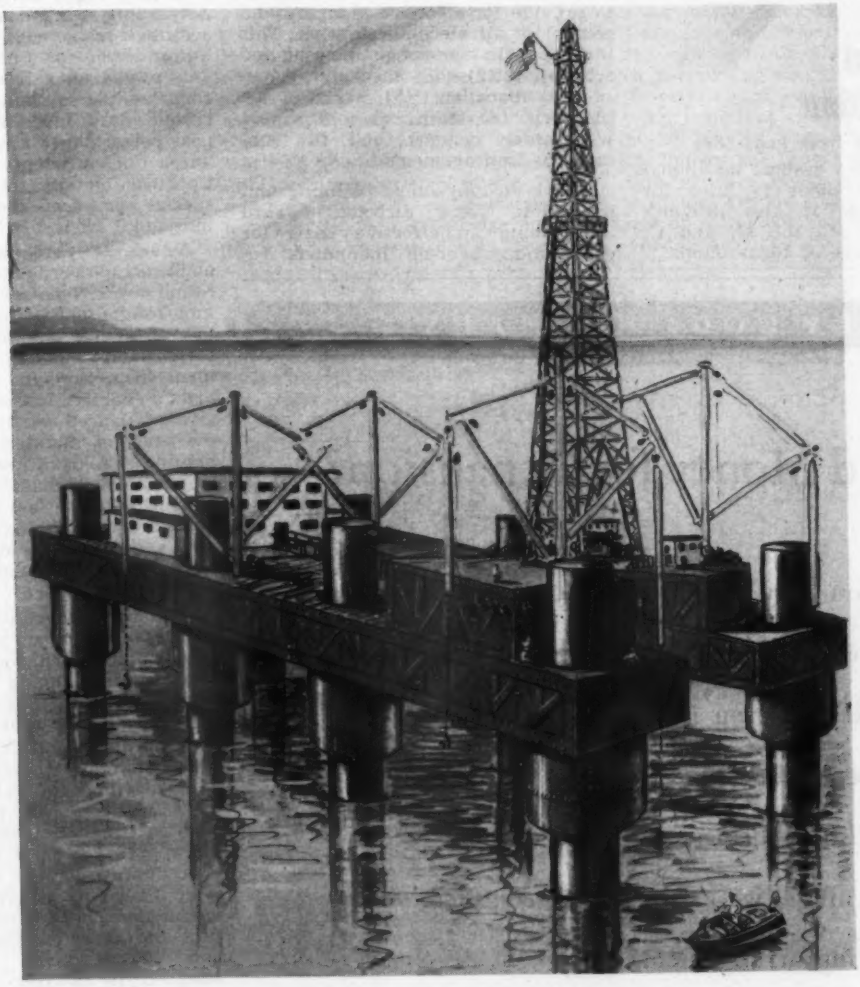
To maintain continuous drilling operations a considerable capacity for stored materials must be provided. Fluid storage such as diesel fuel oil, potable water, and process water is provided for in the top sections of the buoyancy tanks. Fluid mud is stored in special mud tanks. Practically all other operating supplies such as dry mud, pipe, and casing are stored on the main deck. The quantities and weights involved are about as listed below:

	Lb.
Fluid mud (750 bbl.)	500,000
Reserve mud (250 bbl.)	170,000
Dry mud (2,000 sacks)	200,000
Drill pipe	215,000
Casing	550,000
Water, potable (100 tons)*	200,000
Water, process (1,000 bbl.)*	300,000

*Water storage capacity is over twice that listed.

Well Base

In taking up a position at a new location, the rig is in the floating condition with the foundation tanks about 5 ft. above the ocean maintained in the desired location by the winch-operated maneuvering lines. From this position the well-base piling structure, designed to protect the conductor pipe (18-in. casing), is driven about in line with the end of the rig slot, using the end hoisting derricks for this purpose. After the base has been completed, the rig is centered over it and founded on the ocean bottom.



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Should a producing well be brought in, the additional pipe structure required to support flow tanks and other terminal equipment is installed before the rig is removed to another site.

Mechanical Modernization

(Continued from page 184)

the public-address system, additional telephones, and other facilities for expediting work. It also provides coordinators to aid the M. and C. engineer in charge of turnarounds.

From the outset it was apparent that mechanical operations were susceptible to much more careful planning than was currently practiced. Therefore, a principal part of the program, as mentioned before, was to provide for effective planning and control of all mechanical work. This included: (1) long-range planning and scheduling, (2) daily mechanical man power allocation, (3) specific job planning, (4) statistical control, (5) work-order systems, and (6) job-methods improvements.

Efforts in long-range planning and scheduling were directed toward establishing an effective basis for determining over-all manpower requirements for maintenance and construction plus arranging for scheduling turnarounds, construction work, and other mechanical operations. Establishing a basis for determining over-all requirements necessitated developing statistical control procedures. In general, manpower requirements for maintenance are determined on a basis of man-hours required per million dollars of corrected plant investment considering past performance and making allowances for efficiency improvements. Construction programs and other special operations are handled on an individual basis.

A sizable percentage of maintenance manpower is required on turnaround work. This necessitates careful long-range scheduling and involves: (1) preparing an annual long-range turnaround schedule, based on equipment inspection and process department's requirements and arranged to give a balanced work load throughout the year for maintenance forces, (2) holding weekly formal meetings of responsible mechanical, process, and technical supervisors to discuss turnaround and other major work schedules, and (3) preparing weekly short-range turnaround outlooks for issuance to the field.

The daily allocation of manpower to both maintenance and construction is accomplished through daily divisional work-planning meetings. Each of the division engineers conducts special meetings with his second-line craft foremen and M. and C. engineers. Manpower is allocated in these daily meetings by crafts for the next day's work on all jobs over $100 total estimated cost. Lump-sum allowances are made for the smaller jobs. An average of 80 per cent of total manpower is allocated to individual jobs; 10 per cent to the lump-sum allowance for the smaller jobs; and 10 per cent are regularly assigned. In addition to allocation of manpower, questions of coordination between crafts and other items of planning are discussed and settled at these meetings.

The M. and C. engineers are responsible for planning each individual job. For turnarounds and other larger maintenance jobs this takes the form of: (1) having meetings with process and technical departments to determine what specific work is to be accomplished, (2) establishing manning and material requirements for the job, (3) meeting with first-line craft foremen prior to start of the job to outline the specific work, and (4) meeting with the first-line foremen during the course of the job to settle problems of coordination and other points under discussion.

Early in the development of the modernization program it was realized that adequate means were needed for measuring maintenance performance. Systems of control have been

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developed for this purpose with the principal items being as follows: (1) Information was developed on maintenance man-hours required per million dollars of plant investment for the over-all refinery, as well as by crafts and by working divisions. Plant investments are corrected to a base year to permit comparisons between years. Efficiency improvements are based on reducing this ratio each year and this information is plotted and used to build up a competitive spirit among the various groups toward obtaining greater improvements. (2) Daily data showing the number of man-hours worked by each craft on all maintenance and construction jobs are used in the allocation of men to maintenance and construction work. These data also aid in readily checking questions of improper manning and distribution of time.

An effective system for authorization and notification of work was found to be very important. A formal approval schedule was established for authorizing the performance of all mechanical work with arrangements for special handling of emergency maintenance jobs. Work requests are required and written work orders are sent to the field on all jobs. The accounting department ascertains that proper approval is obtained and keeps the necessary accounting records on each job. One master form is used for the work request, job analysis, and field work order.

The necessity for concerted attention toward improving job methods was also recognized. Formerly improvements in work methods were left entirely to the craft supervisory personnel and to the M. and C. engineers. To augment this, provision was made in the program for establishing a mechanical technical service group in the mechanical engineering department. A primary responsibility of this group is to make organized studies of job methods employed in mechanical operations and to make recommendations for improvements.

Training

The need for training was obvious from the beginning and programs were developed for all employes, including supervisors, wage earners, and clerical personnel. The supervisors attend a management information and planning program class about once every month. Subjects covered at these classes included human relations, information on company history and practices, personnel-relations matters, and company policies. In addition, the supervisors participate in a 2-week course in industrial supervision at Louisiana State University. During this course they are entirely divorced from their regular job.

Wage-earner training has taken two principal forms; namely, formal apprentice programs and special on-the-job training. Apprentice classes are organized in accordance with the standards of the U. S. Government's federal committee on apprenticeship. About 10 crafts have had organized programs since the war.

The on-the-job training program is a new development wherein a complete study is made of all craft wage earners to determine the training needs of each individual. Arrangements are then made to rotate the worker's job duties so as to enable him to gain experience in the desired additional operations. This results in a well-rounded knowledge of the work by the wage earner and provides greater flexibility and efficiency within the organization. Clerical personnel have received specialized instruction in timekeeping, office practices, and other needed subjects.

Equipment-Design Considerations

Increasing labor and material costs emphasize the importance of designing new operating facilities for ease in performing mechanical work and for economy in use of materials. Likewise, similar considerations were given to existing facilities. New equipment has been added and existing facilities rearranged to provide sufficient ground space for maximum use of motorized equipment. Certain builtin facilities such as platforms

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and davits have been installed. Economical materials are used for replacements.

Mechanical Facilities

The mechanical facilities at Baton Rouge refinery, prior to the mechanical modernization program, were seriously outmoded. Shop work was carried on in many separate buildings, resulting in inefficiency through repetitive handling of job materials and in lack of coordination between the various shop groups.

There was a serious lack of motorized equipment and power hand tools. Old "lug and tug" methods were still being used where mechanized equipment could be substituted. Similar deficiencies existed in connection with the stores department activities. Materials were stored in a great number of different locations, many of them out of doors. The available buildings and facilities were very old and material-handling facilities were nonexistant. Satisfactory office facilities for the supervisory and clerical staff over all sections of the mechanical division were needed.

A comprehensive study indicated an investment in excess of $7,000,000 was required to provide needed facilities. Based principally on reducing manpower requirements, a payout in 3 years was estimated for the total expenditure. The program included the following mechanical facilities:

1. Centralized shops and storehouse in one air-conditioned building.
2. Necessary machine tools and material-handling equipment.
3. Satisfactory offices for supervisory and clerical staffs.
4. Ample supply of portable, power, and hand tools.
5. A good road system, properly drained and well lighted.
6. Paved work areas around operating equipment.
7. Ample transportation facilities for personnel, materials, and equipment.
8. Builtin maintenance facilities for operating equipment.
9. Modern locker and wash room.
10. Cafeteria systems for serving wholesome food close to the job.

At the present time, practically all of the organizational rearrangements have been completed, a comprehensive program of work planning has been established, features for facilitating maintenance are being incorporated in new construction designs, and progress has been made in altering existing equipment to minimize maintenance costs. Likewise, considerable progress has been made in the two principal associated activities of work - methods improvements, and personnel training. With respect to mechanical facilities, the motorized equipment fleet has been expanded considerably, a large number of additional hand tools have been provided. and the first section of the new cen-

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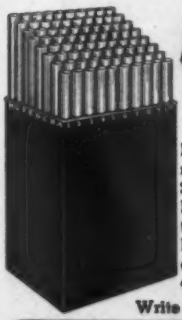
tral mechanical building is in operation.

The central mechanical building is a major part of this program. The section of the building now in operation is 600 ft. long, 236 ft. wide, and 40 ft. high. It is of steel frame construction with transite siding. With the installed equipment and machine tools, it represents an investment of about $3,000,000. Over 200 workmen are normally employed in the building, which houses the heavy shops (boilermaker, blacksmith, pipe, welding, electric, and machine) plus associated stores. Many interesting design features are incorporated in the building. It is completely air conditioned, an interesting fact considering size and that it houses several furnaces, considerable welding operations, and other sources of heat. The fans of the air-conditioning system circulate 300,000 cu. ft. of air per minute and 1,100 tons of refrigeration equipment is required. Twenty-five hundred fluorescent lights provide proper lighting intensity throughout. Acoustical treatment of the walls and ceiling reduces noises below disturbing levels.

Comfort of employes was given paramount consideration in the design of this building. Principal factors in this regard are the air conditioning, high-quality illumination, and noise-level control. In addition, there is a balcony lunch area for the employes and modern sanitation facilities have been provided. Maximum use is made of material-handling equipment, making it unnecessary to use old lug and tug methods. There are three 15-ton overhead cranes, one for each bay. Jib cranes with electric hoists are provided at the various work stations and forklift trucks assist in transporting materials.

Although the regular craft classifications apply to the workmen within the building and supervision is similarly craftwise, the building is actually operated as a single unit. Coordination is provided by an M. & C. engineer. All incoming and outgoing job materials are dispatched from a central station in charge of a job dispatcher. Four other central stations provide headquarters for supervisors, timekeepers, and material-procurement clerks.

Written work requests accompany all jobs sent to the building. When the job material is received, a job card is made out for it at the dispatch station. This card then accompanies the job material from one work location to another in the building. The work request indicates the desired completion date. Should it not be possible to meet this date, the person requesting the work is notified and adjustments are made.



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WEEKS ISLAND

(Continued from page 198)

the advantage of casing off more of the unconsolidated shallow sand beds, thereby reducing the possibility of mechanical difficulties. Penetrating the objective section in the larger-size hole facilitates any operations contemplated, and particularly, the completion of the well.

As is the case in most piercement-type salt domes, the steeply dipping attitude of the strata surrounding the salt stock presents the problem of keeping the hole straight. Experience has indicated that "key seating," twistoffs, and stuck drill pipe will result if care is not given to drilling a vertical hole. Consequently, the deviation of the well bore is recorded at frequent intervals while drilling and corrective measures are employed whenever deflectors exceed 2°. Plats of deflection surveys of the well bore are studied carefully and possible points of trouble determined. Corrective measures are then taken as and if warranted. In general, increases in the number of drill collars used has aided straight-hole drilling.

Because of the depth involved every effort is made to maintain the well bore in excellent mechanical condition. The difficulties and hazards involved in fishing operations at great depths increase considerably, and the chances of successfully retrieving the fish are not as great as at shallower depths. In numerous instances it was not possible to recover drill-pipe fish, and it was necessary to sidetrack the hole around the fish. Operations of this nature have added substantially to well time and well costs.

Most of the earlier wells at Weeks Island required an average of 150 to 200 drilling days to complete. It is worthy of note that seven of the eight most recent deep wells have been completed in less than 100 operating days. This reduction in drilling time and consequent reduction in drilling costs can be largely attributed to the use of heavier-duty machinery and an improved knowledge of deep-drilling problems.

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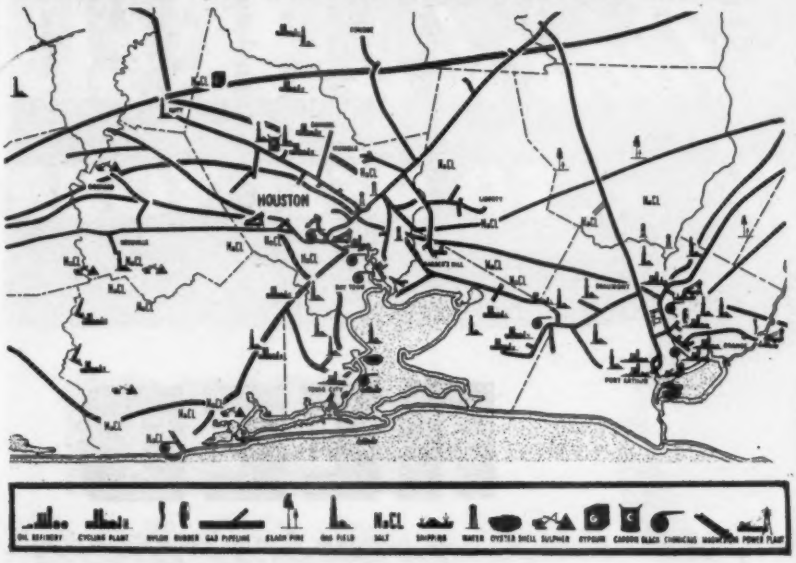

Gulf Coast's Petrochem Plants: Their Locations and Products

THIS report lists petrochemical and associated chemical plants and their products which are located on the Gulf Coast from Lake Charles, La., to Brownsville, Tex., and inland 100 miles from the coast. Many of the important firms in the chemical industry of the United States are included in this list, which shows an imposing array of mass-produced organic-chemical compounds and intermediators produced by these plants. Most of the raw materials are furnished by oil and natural gas.

When the fact is taken into account that practically all of the organic-chemical plants in the Gulf Coast area have been built since 1940 and most of those producing inorganic chemicals also were established during this period, the listings attain added significance. Moreover, although the war gave the initial impulse to this mammoth chemical and petrochem development, unlike many war-born industries in other sections of the country, this new industry of the Gulf Coast area attained its most rapid growth during the postwar years.

At present the value of the petrochemical and chemical plants included in the attached list of plants is estimated at approximately 700 million dollars. This total does not include either the plant expansions now under way or the projected expansions. The total number of workers in these plants is estimated to be approximately 22,000 and the estimated annual payroll about $89,000,000.

Per capita investment of property, plant, and equipment is estimated to be approximately $31,000; average payroll per employe is estimated at about $340 per month or more than $4,000 per year, and average annual sales per employe are estimated at approximately $35,000.

Producers of Chemicals on the Texas Gulf Coast

Company and plant location—	Major raw materials	Products
Aluminum Co. of America,* Port Lavaca	Alumina	Aluminum (pig)
American Cyanamid Co., Corpus Christi	Alumina salt	Aluminum chloride anhydrous
American Smelting & Ref. Co., Corpus Christi	Zinc ore concentrates	Crystalline zinc sulfate, metallic cadmium, sulfuric acid, zinc
Armour Fertilizer Works, Houston	Sulfur acid, phosphate rock	Commercial fertilizers, superphosphate
Best Fertilizer Co., Houston	Ammonia, sulfuric acid	Ammonium sulfate, commercial fertilizers
Carbide & Carbon Chemical Corp., Texas City	Hydrocarbons, sulfur	Acetic acid, acetic anhydride, acetone, acetylene, butyl alcohol, butyl acetate, diethylene glycol, ethyl acetate, ethyl alcohol, ethyl ether, ethylene amines, ethylene dichloride, ethylene glycol, ethylene oxide, isopropyl acetate, isopropyl alcohol, methyl isobutyl ketone, trichlorethylene, vinyl plastic materials, vinylite resins
Carbon Corp. of America, Bishop	Hydrocarbons	Carbon black
Carthage Hydrocol, Inc., Brownsville	Hydrocarbons	Synthetic petroleum products
Celanese Corp. of America, Bishop	Hydrocarbons	Acetaldehyde, acetic acid, acetone, formaldehyde, isobutyl alcohol, isopropyl alcohol, methyl alcohol, methanol, mixed butyl alcohols, methylal, n-propionaldehyde, n-propyl alcohol, paraformaldehyde, special solvents
Champion Fibre & Paper Co., Houston	Saltbrine, pulpwood	Caustic soda, chlorine, hydrogen, tall oil, turpentine
Cities Service Refining Corp., Lake Charles, La.	Hydrocarbons	Butadiene
Clorox Chemical Co., Houston	Chlorine, caustic	Sodium hypochlorite (bleaching solutions)
Columbian Carbon Corp., Houston, Corpus Christi	Hydrocarbons	Carbon black
Consolidated Chemical Industries, Inc., Houston	Sulfur, bone	Sulfuric acid, bone meal, bone char, bone grease, bone oil
Corn Products Refining Co., Corpus Christi	Milo maize	Starches, sugars, etc.
Crosby Chemicals, Inc., De Ridder, La.	Pine stumps	Alpha pinene, anethole, beta pinene, camphene, dark resins, dipentine, ester gums, gloss oils, limed rosins, p. e. ester gums, pine oils, rosin paper size, steam distilled wood turpentine, sulfate wood turpentine, terpin hydrate, terpinoels, wood rosins
Diamond Alkali Co., Houston	Salt, hydrocarbons	Caustic soda, chlorine, hydrogen, hydrochloric acid, perchlorethylene, salt (commercial), trichloroethylene vinyl chloride
Douglass Sulphur Co., Houston	Sulfur	Processed sulfur
E. I. du Pont de Nemours & Co., Orange	Hydrocarbons	Methanol, nylon salts and intermediates (adipic acid, hexamethylene diamine), polythene
E. I. du Pont de Nemours & Co., La Porte	Petroleum byproducts, chlorine	Acetic anhydride, benzene hexachloride, hexachlorbenzene, phenothiazine, various agricultural chemicals including: ferric dimethyldithiocarbamate ("Fermate"), bismethoxyphenyltrichloroethane ("Marlate"), zinc dimethyldithiocarbamate ("Zerlate").

(Continued on page 304)

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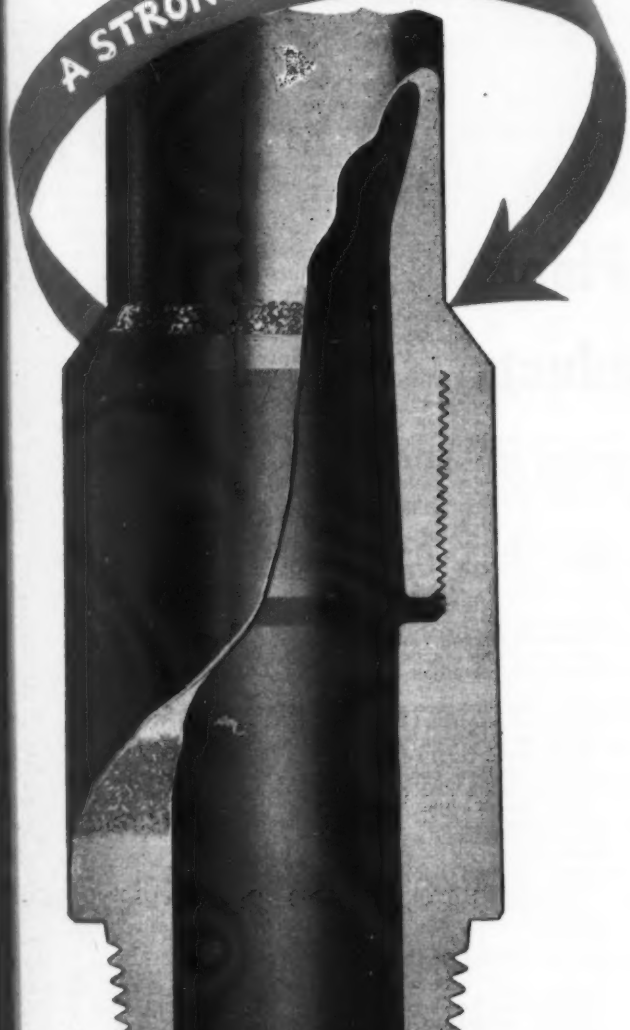

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PRODUCERS OF CHEMICALS ON THE TEXAS GULF COAST (Continued)

Company and plant location—	Major raw materials	Products
Dow Chemical Co., Freeport	Sea water, hydrocarbons, salt, sulfur, chlorine, oyster shell (lime)	Bromine, carbon tetrachloride, caustic soda, chlorine, ethyl bromide, hydrochloric acid, magnesium, magnesium chloride, magnesium hydroxide, magnesium oxide, chloroform, diethylene glycol, dichlorethyl ether, dichloroisopropyl ether, dipropylene glycol, dipropylene glycol mono butyl ether, ethyl bromide, ethyl chloride, ethylene chlorohydrin, ethylene dichloride, ethylene glycol, ethylene oxide, ethylidene dichloride, hexachlor benzene, hexachlorethane, methyl bromide, methyl chloride, methyl chloroform, methylene chloride, perchlorethylene, propylene chlorohydrin, propylene dichloride, propylene glycol, propylene oxide, styrene, tetraethylene glycol, tetrapropylene glycol mono butyl ether, toluene, trichlor ethylene, triethylene glycol, tripropylene glycol, tripropylene glycol mono butyl ethyl ether, vinyl plastic materials, ammonia
E. I. du Pont de Nemours & Co.,* Victoria	Hydrocarbons	Nylon salts
Duval Texas Sulphur Co., Orchard	Sulfur	Sulfur
Finney Chemical Corp., Houston	Sulfur acid, ammonia	Ammonium sulfate
Firestone Tire & Rubber Co., Lake Charles, La	Butadiene, styrene	Synthetic rubber (GR-S)
Freeport Sulphur Co., Freeport	Sulfur	Sulfur
General Tire & Rubber Co., Houston (Baytown)	Butadiene, styrene	Synthetic rubber (GR-S)
B. F. Goodrich Co., Port Neches	Butadiene, styrene	Synthetic rubber (Buna-S)
Goodyear Synthetic Rubber Corp., Houston	Butadiene, styrene	Synthetic rubber (GR-S)
Great Lakes Carbon Corp., Port Arthur	Hydrocarbons	Carbon black
Great Southern Corp., Aqua Dulce, Banquette, Bishop and Driscoll	Hydrocarbons	Butane, isobutane
Gulf Chemical Co., Houston	Phosphate rock, sulfuric acid	Calcium phosphates, disodium dihydrogen phosphate, disodium dihydrogen pyrophosphate, disodium orthophosphate, monosodium orthophosphate, phospheric acid, sodium phosphates sodium tripolyphosphate, tetrasodium pyrophosphate, trisodium orthophosphate
Hercules Powder Co.,* Houston	Hydrocarbons	Ammonia
Houston Oxygen Co., Houston	Air, carbide	Acetylene, nitrogen, oxygen (liquid)
Houston Oxygen Co., Orange	Air	Nitrogen, oxygen (liquid)
Houston Oxygen Co., Port Arthur	Air	Nitrogen, oxygen (liquid)
Humble Oil & Ref. Co., Houston (Baytown)	Hydrocarbons	Butadiene, butyl rubber, cyclohexane, high-boiling aromatic solvents, narrow-boiling range aliphatic solvents, toluene wide variety of specialty naphthas, xylenes
Imperial Salt Co., Houston	Salt	Salt
Independent Oxygen Co., Houston	Air, carbide	Acetylene, oxygen, hydrogen
Jefferson Chemical Co., Port Neches	Petroleum byproducts, chlorine, lime	Aromatic distillate, ethylene oxide, ethylene glycol, ethylene dichloride, diethylene glycol, polyethylene glycol, polyglycol, polychlorinated ether
Jefferson Lake Sulphur Co., Needville, Brazoria, and Clemens	Sulfur, hydrocarbons	Sulfur, carbon black
Kelly-Webber Co., Lake Charles, La.	Phosphate rock, sulfuric acid	Mixed fertilizers, superphosphate
Linde Air Products Co., Houston	Air, carbide	Acetylene, oxygen, nitrogen
Liquid Carbonic Co., Houston	Hydrocarbons	Carbon dioxide (solid)
McCarthy Chemical Co., Winnie	Hydrocarbons	Acetaldehyde, formaldehyde, methanol
Magnolia Airco Gas Products Co, Houston, Corpus Christi, Beaumont	Air, carbide	Acetylene, hydrogen, nitrogen, oxygen
Mathieson Chemical Corp., Lake Charles, La.	Hydrocarbons, salt, oyster shell (lime)	Ammonium phosphate-sulfate, ammonium sulfate, crude pros pheric acid, sulfuric acid, superphosphate, anhydrous am monia, caustic soda, soda ash
Mathieson Chemical Corp., Houston	Hydrocarbons, sulfur, phosphate rock	Ammonium phosphate-sulfate, ammonium sulfate sulfuric acid superphosphate, processed sulfur
Mathieson Chemical Corp., Beaumont, Port Arthur	Sulfur	Sulfuric acid
Merichem Co., Houston	Refinery byproducts	Cresylic acid, petroleum waxes, sodium sulfide
Monsanto Chemical Co., Texas City	Hydrocarbons	Styrene
National Cylinder Gas Co., Houston	Air, carbide	Acetylene, oxygen
Natural Gas Odorizing Co., Houston	Refinery byproducts	Ethyl mercaptan, methyl mercaptan
Neches Butane Products Co., Port Neches	Hydrocarbons	Butadiene
Nyotex Chemicals, Inc., Houston	Fluorspar, salt, limestone, aluminum	Aluminum chloride, anhydrous hydrogen fluoride, hydrofluoric acid, lime, hydrated and quick
Pan American Refining Co., Texas City	Hydrocarbons	Aromatic solvents, drying oils, resin plasticizers, resins
Phillips Chemical Co., Houston	Ammonia, sulfuric acid	Ammonium sulfate
Rohm & Haas Co., Houston	Natural gas, ammonia, ethylene oxide, acetone	Acrylic resin intermediates (including acetone cyanhydrin, and ethylene cyanhydrin)
Sabine Oxygen Co., Orange	Air	Oxygen
Sheffield Steel Corp., Houston	Coal	Coke oven byproducts, including benzene, toluene, xylene, ammonium sulfate, pig iron
Shell Chemical Corp., Houston	Hydrocarbons, salt, sulfur	Acetone, acrolein, allyl alcohol, allyl chloride, diacetone alcohol, diallyl ether, diallyl phthalate, dichlorhydrin, dichloro propane, dichloro propylene, epichlorhydrin, ethyl alcohol, ethyl chloride, hexylene glycol, glycerin, glycerin epichlorhydrin, isopropyl alcohol, isopropyl chloride, mesityle oxide, methyl isobutyl carbinol, methyl isobutyl ketone, methyl ethyl ketone, secondary butyl alcohol, trichloropropane
Southern Alkali Corp., Corpus Christi	Salt, oyster shell (lime)	Carbon dioxide, caustic soda, caustic potash, chlorine, dry ice, hydrogen, lime, soda ash
Southern Alkali Corp., Lake Charles, La.	Salt	Caustic soda, chlorine, hydrogen
Stauffer Chemical Co., Freeport, Weslaco	Sulfur	Sulfur, sulfur insecticides
Texas Gulf Sulphur Co., Newgulf, Liberty	Sulfur	Sulfur
Tin Processing Corp., Texas City	Tin ore concentrates	Tin (pig)
United Carbon Co., Aransas Pass, Corpus Christi, Falfurrias	Hydrocarbons	Carbon black
United Salt Co., Hockley	Salt	Salt
U. S. Industrial Chemicals,* Brownsville	Hydrocarbons	Alcohols, aldehydes, ketones

*Under construction.

Petrochemicals

(Continued from page 173)

they show prospective uses as antifreeze agents as well as wetting agents, humectants, plasticizers, and softening agents. Being nontoxic they offer competition to glycerin for use in foods, drugs, cosmetics, mold inhibitors, etc. Their brightest future is believed to be components in brake fluids.

In addition to the foregoing products now in commercial production, at least 10 other chemicals are in various stages of laboratory, research, pilot plant, or market-evaluation development. The chemical division of Celanese also operates a $1,000,000 research laboratory at Clarkwood, 25 miles north of the Bishop plant. At that pilot-plant installation, much of the new product development is conducted.

Expanded operations have posed a water problem. The original wells proved insufficient when the local water table dropped, and a 25-mile, 22-in. pipe line was run from the Nueces River. River water which is high in sulfonates is mixed with well water, high in carbonates in proper proportions to provide boiler feed water without further treating. The plant has a sizable cooling load, circulating 200,000 g.p.m. of water. Cooling-water makeup is required at the rate of 4,000 g.p.m.

1949 Production

Last year, the U. S. Tariff Commission reported total petrochemical production of 4,989,906,000 lb. Of that total, aromatics and naphthenes amounted to 1,005,493,000 lb. Nearly four times that volume, or 3,984,413,000 lb, constituted aliphatic chemicals.

Total production of finished petrochemicals for 1950 is estimated to reach 12,000,000,000 lb., nearly two and one-half times the 1949 production.[1] Much of this total will comprise the large-tonnage products, including alcohols, acids, aldehydes, glycols, glycerin, fertilizers, insecticides, styrene, butadiene, toluene, detergents, and numerous base chemicals for plastic manufacture. Scores of lesser-known chemicals will provide the basis for synthesizing literally thousands of end products.

Aromatic hydrocarbons loom as an important future class of petrochemicals. Efforts to increase aromatic yields are going forward not only in the chemical plants but in oil refineries. Two strong future uses for aromatics exist. In the chemical field aromatics for solvents, textiles, rubber, explosives, insecticides, and weed killers, to name a few, are now and will continue to be in high demand. Supply of benzene for example is now short and the poor outlook for relief from coal sources is causing buy-

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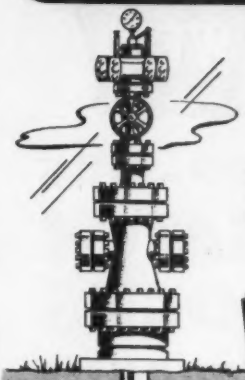

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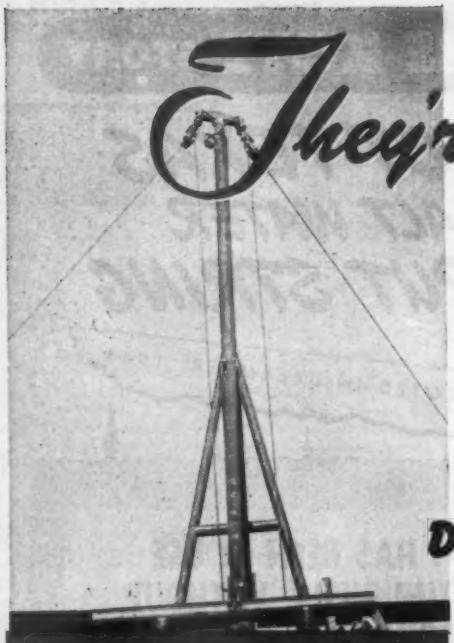

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ers to look more to the petroleum industry for future makeup production.

A second and equally important demand for aromatics is expected to arise from petroleum refiners themselves. This class of hydrocarbons will become increasingly important as motor-fuel components as the octane trend continues upward. Although they are more expensive to make, refiners are constantly seeking better methods to obtain the maximum percentage of aromatic hydrocarbons from each barrel of crude.[2]

Polymerization and alkylation of refinery gases to yield high-octane isoparaffins and naphthenes may be carried a step further by dehydrogenating to produce aromatics of even higher octane number. The important aromatization characteristics of catalytic reforming processes in use and now under development will further the yield of aromatics from each barrel of crude. While such gasoline components will not be classed as petrochemicals, they are in a liberal sense and their ultimate end uses either in motor fuel or as pure chemicals will depend on the relative returns they bring as high-octane blends or as higher-cost concentrated chemicals.

Petrochemical Investments

Egloff[1] has estimated that Gulf Coast petrochemical facilities existing before the war were valued at $65,000,000. Both private and government investment in war plants of that type in that region is conservatively estimated at $1,000,000,000. Adding postwar construction costing $300,000,000 and about $250,000,000 new earmarked for expansion, the aggregate total of $1,615,000,000 provides a fair yardstick of the enormous expenditure for this new industry in a region rich in fuel, raw hydrocarbons and other basic chemicals.

References

1. "Petroleum Chemicals: 1950 and 2000 A.D." by Gustav Egloff, Universal Oil Products Co., presented before the American Institute of Chemists, New York, May 12, 1950.
2. "Aromatic Hydrocarbon Solvents from Petroleum," by Fred Preu, Shell Oil Co., presented before the American Coke and Coal Chemicals Institute, New York, May 15, 1950.

BOOKS

ANNUAL REVIEW OF CALIFORNIA CRUDE-OIL PRODUCTION FOR 1949. Published by Conservation Committee of California Oil Producers, Los Angeles.

This is the eighteenth year that the Conservation and its predecessor organizations have issued an annual review of the activities of the committee, and statistical information relative to crude-oil production. The plastic-ring bound volume contains seven chapters—historical, oil production, conservation data, geological, oil development and new completions, gas production and development, and the conservation committee. It is profusely illustrated by charts, maps, and tables.

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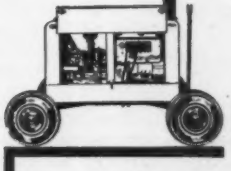

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Use of BOTTOM PLUG In Cementing Operations

by Howard F. Hopkins

FOR many years, since the development of the process of cementing casing in oil wells, it has been common practice to use a plug to separate the column of cement from the column of displacing fluid during its travel period within the pipe. During the era when casing strings were not equipped with guiding and/or floating equipment, a casing cementing plug actually served no effective purpose beyond that of separation of fluid columns. Since this was the only function demanded of plugs at this time, the design could be of the simple spaced-washer type. This was the case for many years.

Gulf Coast Aided Design

As the industry progressed, and wells were drilled to greater depths, two things occurred which demanded that casing cementing plugs be changed and improved. The increase in completion depths forced the development of floating equipment as an aid to drilling rigs and created a demand for a plug which would efficiently shut off when it arrived at float on bottom of casing, this being especially true in Gulf Coast areas.

Previous to the advent of floating equipment, the position of the cement plug within the pipe was determined either by the use of a measuring line, by counting pump strokes and calculating volume of displacing fluid, or by a combination of both. With an adequate means of stopping and retaining top cementing plugs within the pipe, and a plug so designed that it would shut off further fluid passage when so retained, it was easy to determine when plug had been properly landed by noting displacing pressure.

Subsequent to the development of a plug of greater wiping ability and more positive ability to "shut off" when landed, previously unheeded problems began to appear. It became noticeable that in many cases, where only a single piece of guiding or floating equipment was used, the bottom one or two joints of casing were not properly cemented. Now, except in cases of casing strings which are swung an excessive distance off bottom of drilled hole, the lowermost joints would normally be expected to be most efficiently cemented. One of the most logical explanations of this type of cementing failure lay in the conclusion that the top cementing plug was wiping a considerable quantity of contaminant (mud, etc.) from inside of casing and depositing it at lower extremity of casing—usually outside and above casing shoe. The amount of contaminant which might be gathered by top plug during its travel through pipe would be influenced by state of cleanliness of pipe when run, type of mud being used, amount of cement run and its ability to clean pipe, and many other factors.

With so many variables to be considered it naturally follows that each job would give different results. To be sure, however, the danger of the above-described undesirable results are always present to some degree when only one plug is used, i.e., a top plug. A film of contaminant of only .010 in. thickness, when completely removed, in a 7-in., 24-lb. per foot casing, would give a total volume of 1.5 cu. ft. per 1,000 ft. of casing wiped. Even a film of such thin proportions could, in a 10,000-ft. well, contaminate 68 ft. within the pipe or 30 ft. inside pipe and a distance of approximately 33 ft. above the shoe outside the pipe in a 9¾-in. hole.

Two solutions to the above problem were generally adopted by industry; i.e., spacing a float collar in casing string one or more joints off bottom, and use of a bottom plug which was run immediately ahead of cement. This idea of running a bottom plug was not entirely new at this time; however, it can be correctly stated that it was brought into prominence and made commonplace in many areas at this time.

Use of such a plug served two main purposes, the most important of which was the wiping of pipe ahead of cement column. The second main purpose was that of preventing possible mixing of cement and the drilling fluid being pushed ahead until cement started out bottom of pipe. The importance of the latter function is a variable which is affected by casing size, type of cement, type of mud, rate of fluid travel, and other factors. Certainly it is an advantage to delay contact of the cement and the drilling fluids as long as possible. Temperature surveys run on jobs where bottom plug was run usually show a more pronounced and definite "cement top" than surveys where such a plug was not used, indicating a minimum of fluid contamination.

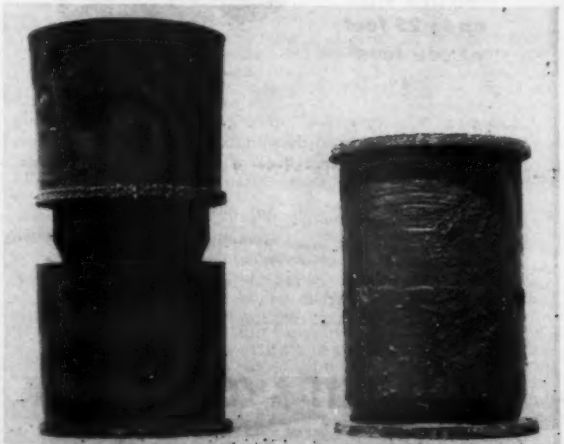


Fig. 1—Wooden plugs of early period design.

Development of Plugs

With the above advantages to be gained by use of two-plug system apparent to the industry, it is probable that the method would have been more generally and enthusiastically accepted had it not been for an occasional case of plug failure. These bottom plugs, in this early period, were made of wood, and presumably the failures were due to "splintering." This splintering action might possibly take place at the time the plug landed, thereby resulting in a premature shutoff or an interference with top plug when it landed. In either case the results were certainly undesirable. Plugs typical of this period are shown in Fig. 1.

Recently, cementing plugs have been developed which are competent and superior in design. The hazard of possible failure on the part of bottom plug or top plug has been reduced to the degree that no failures have been reported from several hundred jobs done. The improved type of cementing plug, both top and bottom, which is now offered to the industry is shown in Fig. 2.

It will be noted from the cutaway section of both plugs that the bottom end of each is shaped to fit correctly into the top area of all stand-

The Author

Howard F. Hopkins has had wide experience in oil-well cementing. Presently South Texas division engineer for Halliburton Oil Well Cementing Co., he has been with that concern since 1937. He served as cementer, drill-stem tester, and in general field operations for Halliburton between 1937 and 1946. At that time he was made Southwest Texas division engineer with headquarters in Corpus Christi. He came to Houston in his present capacity in 1947. Hopkins is a native of Fort Worth, and received his higher education at Texas Christian University and Texas Technological College. His degree of bachelor of science in petroleum engineering was received from Texas Tech in 1933. During World War II, Hopkins left Halliburton for 4 years to serve with the U. S. Army Corps of Engineers in the China-India theater. He was discharged as a captain.

distort bottom plug, the top plug would be fairly certain to remain in proper position to shut off. (See Figs. 2a, 2b, and 2c).

Some operators are reluctant to open the top of the casing once circulation has been established after casing is landed. This reluctance stems from two main reasons, i.e., fear of entrapping air in fluid column, and "freezing" of pipe when circulation is stopped for any reason. With the exception of very rare cases, it is the opinion of the writer that air entrapped in pipe during placing of plugs in casing is of no consequence.

Danger of Pipe Freezing

The danger of pipe freezing in hole where circulation is stopped in much greater in some areas than in others. Experienced drillers and operators can usually predict the eminence of this hazard ahead of time. Where this hazard is prevalent, it is necessary that every precaution be taken to prevent any stoppage of circulation. Insofar as surface cementing equipment is concerned with this problem, the double-plug-type plug container meets all requirements.

writer feels that a partial summary of same in sequence of value might be made as follows:

1. Prevents occurrence of contamination immediately below top plug by removing such materials from casing ahead of cement column, which in turn assures a good cement slurry at lowest extremities of casing string.
2. Prevents mixing of cement and drilling fluids until cement is ready to start its return trip up the annulus between casing and hole, thereby reducing possible circulating pressure, total contamination, etc.
3. Serves to assist top plug in positively shutting off.

Without further reiteration, it is the opinion of the writer that the use of a bottom plug in cementing oil wells has proved to be of sufficient value to merit serious consideration by the oil industry. Plugs of more recent design have been in use in enough areas to verify their safety and efficiency as well as to prove that they offer all advantages outlined in this article.

Acknowledgment

The writer wishes to recognize the assistance of William D. Owsley, technical adviser of Halliburton Oil Well Cementing Co., Duncan, Okla., and Fred K. Fox of the same company in Houston. He also wishes to express his appreciation to Halliburton for the privilege of publishing this article.

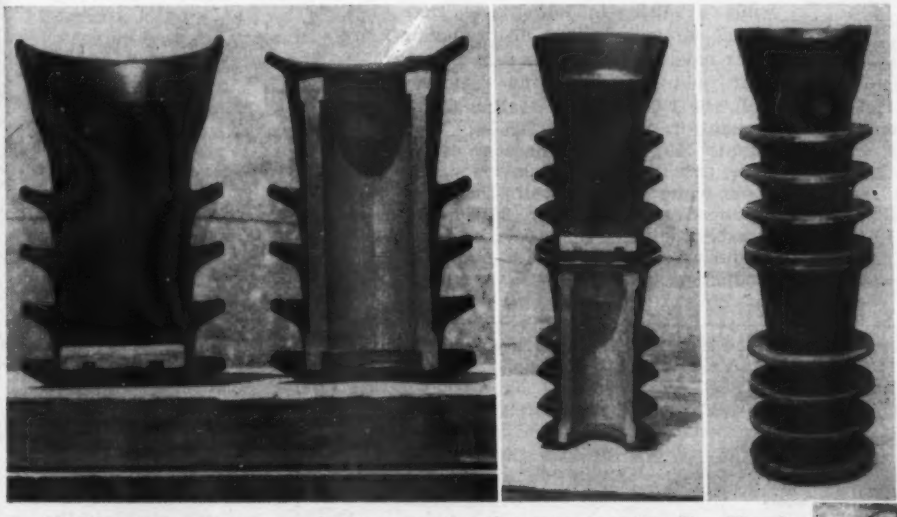
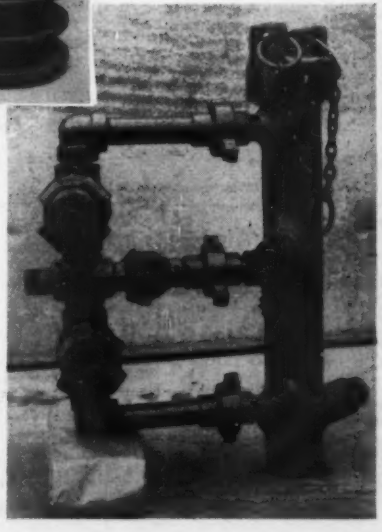


Fig. 2A—(Left) Improved type top and bottom cementing plug, cutaway section. Figs. 2B and 2C (above center and above right) show running position.

Fig. 3—(Below) Surface cementing equipment, double-plug-type plug container.



ard makes of floating equipment and, when run as a team, the top plug fits perfectly into top of bottom plug. It can also be noted that the metal part of top plug is so stationed that it serves as a positive reinforcement to remainder of plug when landed on either bottom plug or floating equipment. Cementers feel that, should a piece of junk be in the casing string at the time of cementing operation, the bottom plug would aid the top plug in properly shutting off by serving as a seating or shock-absorbing cushion upon landing of top plug. Even though the junk might tilt or

Such plug containers are designed so that the bottom and top plugs can be released at proper time without opening casing. (See Fig. 3).

Now, with plugs available that are both highly efficient and safe to run, and cementing-head equipment specially built to handle these plugs without opening casing during entire cementing operation, it is possible to utilize the two plug method in any area. The advantages to be gained by use of a bottom cementing plug are multiple. Though it might be erroneous to emphasize the importance of any single advantage, the

XUM

OIL EXPLORATION IN Florida DURING 1949

by Herman Gunter*

EXPLORATORY drilling in Florida during 1949 kept pace with the activity during 1948. The records show that 24 wells were completed, 3 begun late in 1949 were drilling on December 31, 1949, and 2 locations were made. This compares exactly with the number completed in 1948, but five wells were drilling December 31, 1948, as compared to three on the same date a year later. Fig. 1, an index map of Florida, gives the approximate location of the wells drilled in 1949.

*Director, Florida Geological Survey, Tallahassee.

Fig. 1—Index map of Florida, giving approximate locations of the wells drilled during 1949.

Production

With the addition of four new oil wells in 1949, including one completed January 3, 1950, 13 producing wells have been completed in Sunniland field. However, the discovery well, the 1 Gulf Coast Realties Corp., brought in September 26, 1943, was shut in May 10, 1946, because of decline, and it has been converted into a salt-water disposal well. This well produced approximately 20,550 bbl. of asphaltic-base, 20.8° A.P.I. gravity oil during its 2 years and 8 months of production. In 1949, 12 wells produced a total of 441,720 bbl. Fig. 2 delineates this field and nearby prospects.

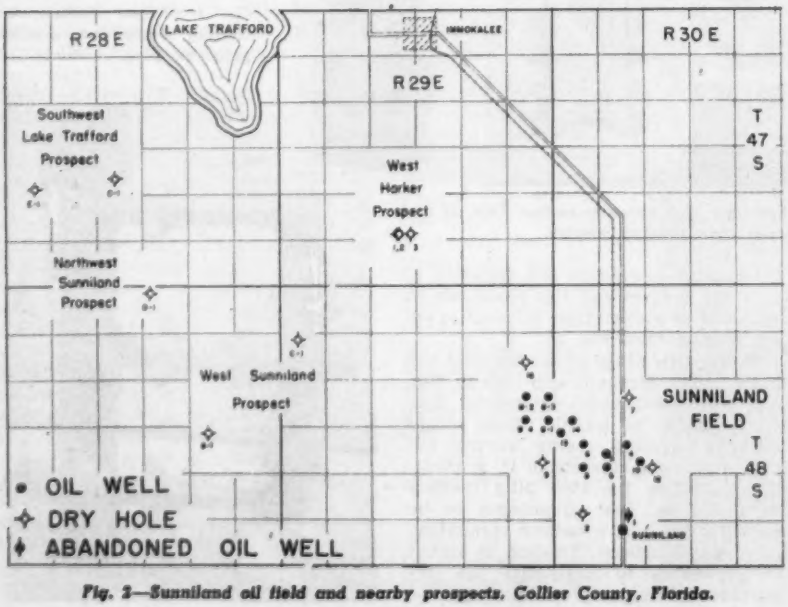


Fig. 2—Sunniland oil field and nearby prospects, Collier County, Florida.

Introduction

Florida, situated geologically entirely within the Coastal Plain province, has always been considered favorable territory for oil and gas prospecting. The first test well drilled in 1900 was in the westernmost county of the state. During the succeeding 39 years there were 79 exploratory wells drilled. In 1939 a well 10,006 ft. deep was completed in Monroe County, southern Florida, and terminating as it did in sedimentary formations, the data caused the major oil companies to view with new interest the possibilities in Florida. Thus stimulated, prospecting was greatly accelerated in 1940-1949, resulting in 154 tests having been drilled in the 9-year period, as compared

with 79 tests in the preceding 39 years.

Sunniland field (Florida's only field) in Collier County, southern Florida, was discovered and developed by Humble Oil & Refining Co. Within the field 19 wells have been drilled, 13 of which proved successful, 2 had good shows of oil, and 4 were dry. At present there is one well drilling in this field, the 17 Gulf Coast Realties Corp.

From year to year since the discovery well came in, September 26, 1943, increased production from this field has been recorded as follows:

Period	Barrels
1943	4,032
1944	11,838
1945	27,510
1946	56,884
1947	259,345
1948	291,221
1949	441,720
Total	1,092,550

The monthly production record for 1950 is:

	Barrels
January	32,095
February	26,091
March	31,963

In the latter part of 1949 the production of crude oil from the field was decreased. Two very evident contributing causes were disturbed economic conditions and a large increase in imports of foreign oil. The decline can in nowise be attributed to any reduction in the potential resource, for at the close of 1949 an all-time production peak was recorded. In a survey of the oil industry of the United States it has been found that productive capacity is increased with each new well and field brought in, therefore, in many large wells and small fields the productive capacity has been shut in and drastically reduced because of an oversupply. Reduction in capacity has affected even such a small field as Sunniland in Florida, as is noticeable from the monthly production record during 1949. For the first 8 months of 1949 oil production averaged 40,075 bbl. per month, while for the last 4 months it was only 30,281 bbl. per month even though production volume had been supplemented through an additional well.

The producing zone in Sunniland field is encountered at depths varying between 11,535 and 11,597 ft. The gravity of the crude asphaltic-base oil ranges from 19.2° to 26.4° A.P.I. Of the 12 wells now in production, 6 are flowing and 6 are being pumped.

Developments in 1949

Prospecting last year was confined more or less to areas considered of greatest potentiality and test drilling was well distributed within such areas. No oil-producing wells outside Sunniland field were brought in and no outstanding prospecting records were made, yet the results were not altogether disappointing for a valuable contribution was made to the subsurface geology and stratigraphy of the state. Regional geology of Florida is better understood as the samples and cores from each deep well are studied and correlated. These cumulative data set forth in comprehensive form will undoubtedly serve those interested in structure and stratigraphy.

Recently, September 1949, the Mesozoic Committee of the Southeastern Geological Society, with headquarters in Tallahassee, prepared for the Gulf Coast Section of the Mesozoic subcommittee of the American Association of Petroleum Geologists a series of cross-sections as follows:

AA, Walton County to Monroe County, Florida.

BB, Beaufort County, South Carolina, to Highlands County, Florida.

DD, Dixie County to Nassau County, Florida.

CC, Toombs County, Georgia, to Volusia County, Florida.

EE, Bullock County, Alabama, to Franklin County, Florida.

These cross-sections are based on detailed studies of samples and cores from numbers of wells, the studies having been made by several geologists and micropaleontologists connected with major oil companies.

Other publications during the year were: "An Evaluation of Sunniland Crude Petroleum," and, "Some Notes

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on Florida Crude Petroleum," issued by the Florida Engineering and Industrial Experiment Station, University of Florida, Gainesville. The results of the complete fractionation were sufficient for concluding that Sunniland crude oil is a suitable source of gasoline, fuel oils, and asphaltic materials.

Oil activity in Florida during 1949 began slowing down and geological explorations and leasing activities were almost negligible at the end of the year. A number of companies moved their offices from Florida, and those remaining reduced their staffs, with one exception. Three of the major companies still retain district offices at Tallahassee. Still under lease in Florida are approximately 20,000,000 acres in 67 counties, held by 21 companies and a large number of individuals. The major lease holders include the following: Humble Oil & Refining Co., Coastal Petroleum Co., Gulf Oil Corp., Sun Oil Co., Stanolind Oil & Gas Co., Magnolia Petroleum Co., and The Texas Co.

Gulf Coast Hot Spot

(Continued from page 203)

well was drilled. Since then, the field has been almost completely developed in the next deeper oil sand —the "Z-2" sand. A third oil horizon (the "W-1" sand) is currently under development. Locations have been made ahead for a fourth oil sand—the "V" sand. These four major oil reservoirs are to be developed throughout the field. Nineteen future locations have been staked.

The structure of East Village Mills field is an elongated fold, almost east and west in direction, on the downthrown side of a down to the coast fault. This fault varies in amount of throw from 100 to 185 ft. The accumulation is probably due to this typical fault structure—a fault back of a fold.

Drilling and Development

Development of the field has been on a 40-acre spacing pattern. No dual completions have been attempted. It is believed that the life of the wells will be such to justify individual producers. Also, some paraffin trouble has been encountered which would add to the inherent difficulties of dual completions.

No unusual drilling problems have been encountered in the development of East Village Mills. Drilling has been done by medium-duty steam rigs. Either 10¾ or 9⅝-in. surface casing has been used with a 5½-in. production string. In a few extremely sandy locations, 16-in. surface pipe has been used. Average drilling time on the wells has been 14 days. Casing is being set through the producing horizons and the well completed by perforating, and squeeze cementing if necessary. Scratchers and centralizers are being used, and only 1 cementing failure in 23 jobs has been experienced. Both jet and bullet perforating are being used. Gamma ray and electric logs (either Schlumberger or Halliburton) are being run on all wells.

The field is producing a paraffin-base crude of high gravity. All wells are flowing up to this time. The gravity runs from 40.5° to 42.5° in the three reservoirs developed to date. Production is going into 1,000 psi. separators in order that the gas may be delivered to pipe-line connections as salable gas. No chemical treatment of the crude is necessary, but heater-treaters have been installed. Negligible salt water is being produced. Pipe-line connection for the field is the American Petroleum Co. line which runs to Silsbee, Tex.

Some paraffin trouble has been encountered in wells producing from the Z and Z-2 sands. This problem has been solved by running 1,100 ft. of plastic-coated tubing at the top of the string. This procedure has been followed since the first six or so wells were drilled.

Oil-water contacts for each reservoir now under development have been established. Average gas-oil ratios for the three reservoirs under development are as follows: Z=620; Z-2=530; and W-1=800.

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Cumulative production of East Village Mills as of March 1, 1950, was 314,889 bbl. The field was producing 2,438 bbl. daily as of that same date. This figure has climbed since that time as five to six new wells are being brought in each month.

As it has been only a year since the discovery well was brought in, it is not known for sure whether there is a water drive in the field or whether the production mechanism is gas in solution. However, a water drive is suspected.

Humble Oil & Refining Co., the only large operator in the field, has production in the western sector. Humble has completed 12 wells at present and is developing its acreage with one company rig. Houston Oil and American Republics began with one rig, but soon added two more and are operating all three at present —two company rigs and a Housh Drilling Co. rig. Houston Oil and American Republics have 650 - 700 presently proven productive acres and Humble has approximately 300.

In addition to the operators mentioned previously, there are several operators with smaller interests in this field. These are Marrs McLean of San Antonio, Lyons & Prentiss of Shreveport, and Texas Gulf Producing Co. of Houston.

As of May 1, completions in the field by sands and by operators were as follows:

	Z	Z-2	W-1	Y	Total
Houston Oil-American Republics	14	17	5	0	36
Humble Oil & Refining Co.	7	4	0	1	12
	21	21	5	1	48

Two dry holes have been drilled in the East Village Mills area. Ed Omohundro of Beaumont drilled his 1 Carrol in the townsite of Village Mills to the southwest of production. Houston Oil and American Republics drilled a wildcat, the 1 Bertie Robinson, north of the fault (the upthrown side), and it was dry in all horizons.

The four reservoirs which are presently being developed are considered major oil reservoirs. There is no original gas cap present in any of these sands. Future development plans of the other producing horizons are in the initial stage, and are presently being analyzed.

BOOKS

DRILLING AND PRODUCTION PRACTICE, 1948. Published by American Petroleum Institute, 50 West 50th Street, New York. 317 pp. $5.

This book contains papers on drilling and production practice selected by the publications committee of the A.P.I.'s Central Committee on Drilling and Production Practice from papers presented at national and district meetings of the Division of Production in 1948.

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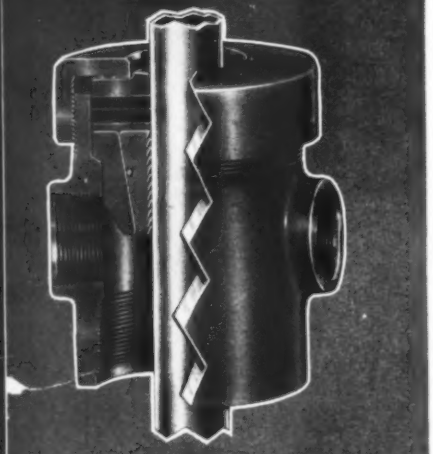

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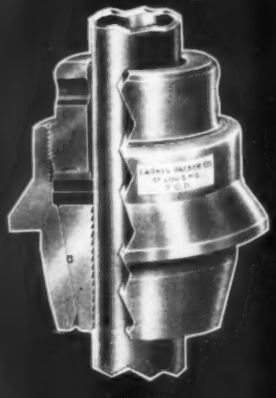

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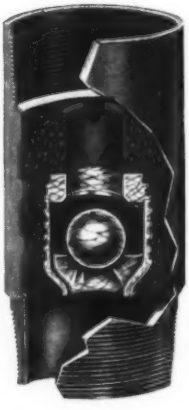

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Gulf Coast Pilot Flood in 11,000 Ft. Gas-Condensate Reservoir

by C. H. Augsburger

A PIONEERING pilot water flood of an 11,000-ft. gas-condensate reservoir has been undertaken in Old Ocean field, Texas Gulf Coast. Pilot injection was necessary because there are no other water-flood projects in operation that have the problem of injecting a large quantity of water to maintain pressure on a gas reservoir at the depths and pressures encountered at Old Ocean.

Old Ocean field is a faulted domal structure located in Brazoria and Matagorda counties, Texas. Productions is obtained from Frio formation of Oligocene age over an area of approximately 17,00 acres. It is approximately 12 miles long and 3½ miles wide. The field contains one of the largest gas reserves in the state and is also important as an oil reserve. The operators of Old Ocean field have joined in a unitization agreement and designated J. S. Abercrombie Co. the unit operator. Approximately 99 per cent of the adjusted acre-feet of the royalty interests have also joined the unitization agreement.

The Larsen reservoir, which is the deepest and largest of the four producing reservoirs in the field, is encountered at subsea depths from —10,300 ft. on the crest of the structure to —11,250 ft. on the east flank. It is essentially a retrograde gas-condensate reservoir with a C_5+ yield of 45 bbl. per M.M.c.f. of gas. This reservoir is composed of three massive sands known as the F-19, F-20, and F-21 members.

C. H. Augsburger's entire oil-field career has been spent at Old Ocean, one of the major fields of the Texas Gulf Coast. He was reared in the nearby town of Sweeny and worked in the field during summer vacations for J. S. Abercrombie Co. Augsburger is a graduate petroleum engineer from Texas A. & M. College and served during World War II in the Army Corps of Engineers. He has worked since graduation as a petroleum engineer for Abercrombie at Old Ocean.

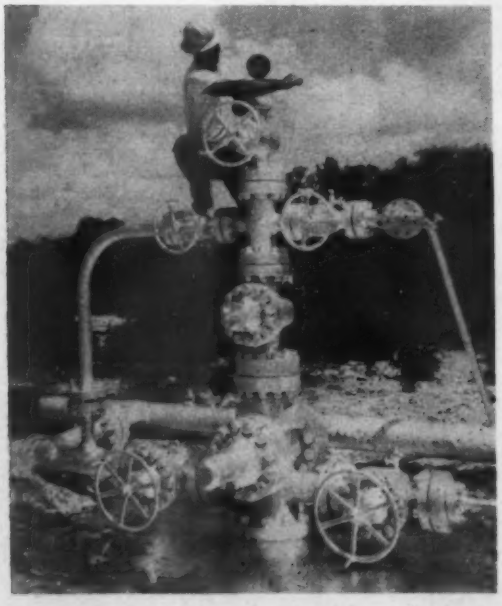
Geological data and reservoir pressure performance have indicated that all three members are in communication due to faulting in various sections of the field. The weighted average porosity varies between sand members from 22.4 to 25.1 per cent and the weighted average permeability varies from 644 to 1,553 md. The present weighted average reservoir pressure is 4,538 psi., a decline of approximately 525 psi. from the original pressure. There has been practically no loss to date due to retrograde condensation. At present, the producing rate is 180 M.M.c.f. of gas per day with 3.2 per cent from the F-19 member, 14.5 per cent from the F-20 member, and 82.3 per cent from the F-21 member.

A study of the Larsen reservoir indicated that probably the most efficient method of production and reservoir control could be obtained with water injection for pressure maintenance. Pressure maintenance of reservoir will require 130,000 or more barrels of water injected daily.

A well located on the periphery of the structure was selected for the pilot test. This well penetrated the F-21 member, which is the lowest member of the Larsen reservoir, below the water table.

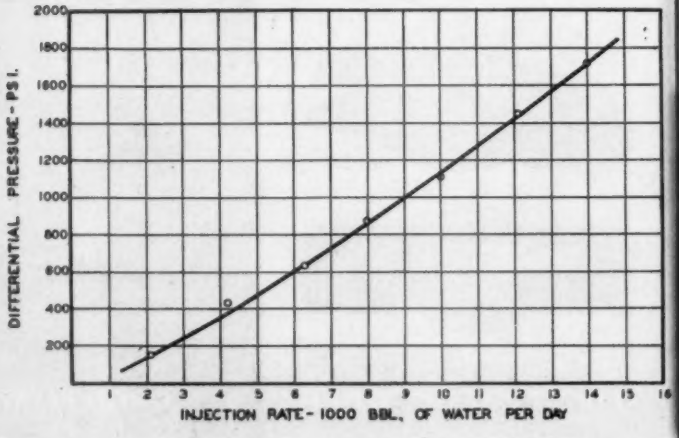
At a public hearing held by the Railroad Commission of Texas, a request was made to conduct the pilot test, and should it be successful, to continue with the water-injection program. The commission in an order dated October 18, 1949, granted permission to conduct the pilot water-injection program.

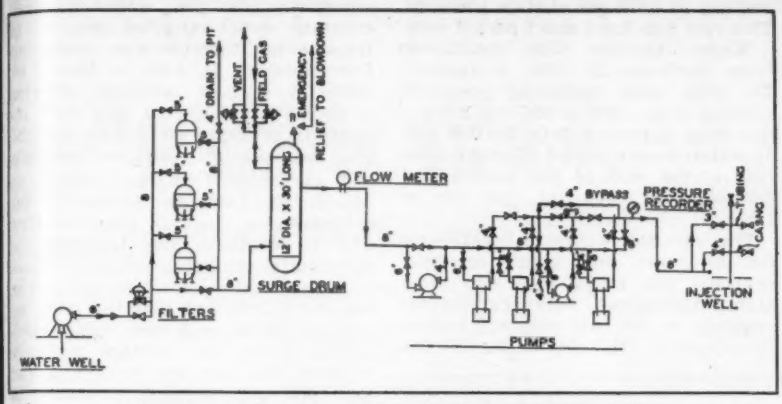
A test water-supply well was drilled



Left: A single injection well has been used to date in water flooding the 11,000-ft. gas-condensate reservoir in Old Ocean field. Arthur E. Pate of J. S. Abercrombie Co. is adjusting the pressure gage on the injection well christmas tree.

Below: Chart of water-injectivity data, sand-face conditions, T. W. MacDonald "A" No. 3, F-21 Sand Larsen reservoir, Old Ocean field.





Flow diagram for pilot water injection plant, Old Ocean field.

into the shallow Pliocene sands and five water-producing sands were tested separately. Samples of the produced water were obtained from each section for chemical analysis and permeability tests made with core plugs from the F-21 member. The tests and analyses indicated that the water from the two shallowest sands was most desirable for injection into the Larsen reservoir. Only a slight decrease in the permeability of the core plugs occurred when the water was passed through the sand. The waters tested varied in salinity from 1,312 to 53,530 p.p.m. with that presenting the most favorable characteristics having a salinity of 2,685 p.p.m. and located at a depth of 832 to 1,254 ft. The permanent water-supply well was drilled to 1,275 ft. and 10¾-in. casing set with 280 ft. of screen spaced opposite the sands to be produced. A centrifugal pump was set and the well tested 40,000 bbl. per day with 142 ft. drawdown.

It was necessary to rework and deepen the well selected for water injection in order to prepare it for this service. The well had been drilled previously to a total depth of 11,020 ft. and 7-in. o.d. casing set at 11,009 ft. The well had penetrated 65 ft. of effective sand in the F-21 member with an average permeability of 701 md. The remainder of the member was cored during the workover, recovering 44 ft. of effective sand with an average permeability of 35 md. This section from 11,009 to 11,110 ft. was left uncased and the remainder of the F-21 sand was perforated from 10,917 to 11,009 ft. with eight shots per foot.

After several unsuccessful attempts to completely seal off upper perforations in the casing by squeeze cementing, it was necessary to set a 5-in. o.d. liner from 7,997 to 10,400 ft. The well was completed with 2⅜-in. o.d. tubing from the top of the liner to the bottom of the 7-in. casing and 2⅞-in. o.d. tubing from the top of the liner to the surface. The tubing was set without a packer and five gas-lift valves were placed in the string for backflowing the well. The surface connections permitted water injection into the casing and/or the tubing.

Since the pressures, volumes, and other problems that would be encountered in injecting water into the Larsen reservoir were not known and estimates of these conditions had varied considerably, the design of permanent surface equipment could not be made until injection-performance data had been obtained. A temporary installation was made using surplus equipment from the Old Ocean Unit gasoline plant. It

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THE OIL AND GAS JOURNAL

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consisted of three 108-in. pressure-type water filters, a 500-bbl. closed surge tank, four steam-driven 20 by 20 by 7¼-in. plunger pumps, six oil-field-type 125-hp. boilers, and other minor equipment. This equipment was installed and ready for service when the workover of the input well was completed.

The initial injection rate was 9,000 bbl. of water per day at 1,700 psi. surface pressure. The well was acidized with 3,500 gal. of mud acid and 500 gal. of wash acid and injection continued without flowing out the acid. After acidizing, the maximum injection rate was 19,600 bbl. per day at 1,450 psi. surface pressure. This rate was for a short period only.

Water injection was continuous from December 26, 1949, to January 24, 1950, with operating pressures varying from 1,600 to 800 psi. During this time approximately 300,000 bbl. of water were injected. The injection rate at the end of the period had decreased to 8,500 bbl. per day at 1,000 psi.

The injection well was backflowed for 39 hours and water injection resumed. The initial rate again was high, decreasing with cumulative injection to the rate obtained before backflowing. To determine if the injectivity of the well remained constant over extended periods of time, water injection was continuous from January 24, 1950, to March 10, 1950, at surface pressures varying from 1,000 to 1,100 psi. The well injectivity varied from 8.2 to 8.8 bbl. per day per psi. surface pressure.

A series of tests was begun on March 14, 1950, to determine the injectivity at various rates of flow and to evaluate the friction and differential sand face pressure. These tests have not been completed as yet, but have indicated that the well injectivity varies with rate from 13 bbl. per day per psi. surface pressure at 2,100 bbl. per day to 7 bbl. per day per psi. surface pressure at 14,000 bbl. per day. The tests have further indicated that the injectivity decreases to a minimum value for any set rate of injection with a cumulative injection of approximately 100,000 bbl. of water after backflowing the well.

Friction drop calculations had indicated that friction would be excessive while pumping large volumes of water through the 2⅜-in. o.d. tubing and through the tubing and 5-in. o.d. casing annulus. The maximum value of friction measured while injecting water through the tubing and tubing and casing annulus was 292 psi. at a rate of 14,000 bbl. per day. The friction drop was obtained by the use of a Humble type pressure-recording device.

The differential sand face pressure as determined was extremely high. The plot of rate of water injection versus differential sand face pressure shows a rapid increase of sand face pressure with rate in almost a straight line. A major part of the sand face pressure is due to a pressure buildup in the reservoir in the vicinity of the injection well, indicated by the ability of the well to flow after being closed in for 48 hours.

J. S. Abercrombie Co., unit operator, has applied and obtained permission from the Texas Railroad Commission to convert two additional wells to water injection in the F-21 member of the Larsen reservoir.

Acknowledgment

The writer wishes to express his appreciation to C. W. Shively, assistant to the vice president; C. R. Burney, chief engineer; F. A. Hunter, district engineer; and to others of the engineering department, as well as to the management of the J. S. Abercrombie Co., for help and suggestions in the preparation of this article.

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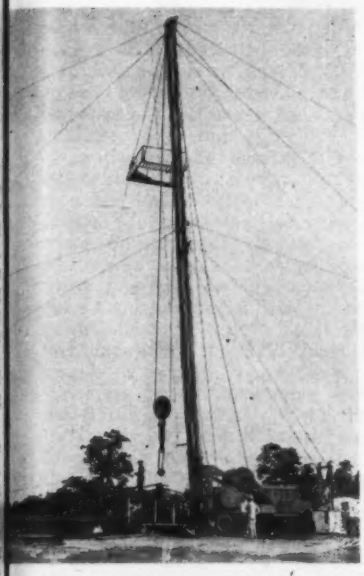

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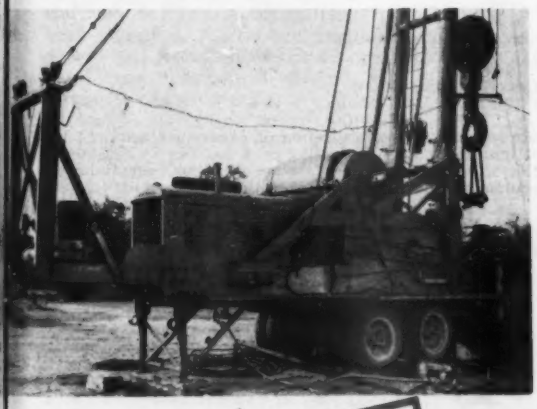

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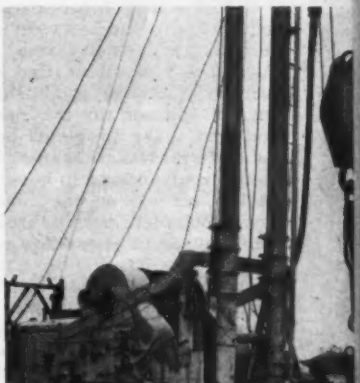

Right: Self propelled Model L-844, tractor, double drum, with 85 foot heavy mast and racking board.

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Wave, Tide, Current, and Hurricane Problems

(Continued from page 177)

and geophysicist, does not have an exact science at his disposal, what is the order of accuracy of his science? To answer this objectively, detailed summaries of the accuracy of the twice-daily wave and wind forecasts have been prepared each month since forecasting commenced for each location from which observations were made.

At present a total of about 15,000 simultaneous wave and wind observations have been made at 18 locations in the delta area and compared with conditions forecasted for the time of observation. A summary of these accuracy analyses which were initially included in monthly reports for the operators concerned is shown (Figs. 6 and 7) by Glenn and Bates,[10] and referred to by Pennington and Posgate.[11] Briefly, it has been found that the advice of the meteorologist is reliable (wave forecasts within 1.5 ft. or later observed conditions) in 85 to 95 per cent of all cases for periods up to 24 hours in advance and in 75 to 85 per cent of all cases for periods up to 48 hours in advance. Beyond the 2-day period, the accuracy depends on the particular weather situation and in any case, the reliability of the forecast is indicated by the meteorologist to avoid reliance on questionable forecasts.

Based on published papers[12 13] concerning the reasons for and results of the use of this service in coastal oil operations by two companies, and the continuity in service provided operators in the delta area, it seems reasonable to conclude that this specialized service is established as a superior solution to the operational wind and wave problems arising in offshore and coastal drilling. Such inherent disadvantages in governmental weather service as the inability to provide complete personalized service to individuals in emergency situations and inaccuracies due to generalized forecasts such as those indicated by Leonard and Farley[14] render it ineffective compared to the specialized approach. This is emphasized by a number of cases in which important differences in operating efficiency and safety resulting from differences in the use of meteorological information have been obvious. Experience during the March 26-27, 1950, storm outlined herein compared with that mentioned by Schneider[15] is one example. The situation is reflected by the fact that in early 1948 all offshore operators depended on the governmental weather service, in early 1949 most of them did,[16] and today four of the nine active offshore operators have depended on this specialized service, for con-

TABLE 1—GENERALIZED WAVE PERFORMANCE* DATA FOR OFFSHORE CRAFT AND OPERATIONS
(Maximum wave height limits in feet)

Type of craft and/or operations—	Safe, efficient operation	Marginal operation	Dangerous and/or inefficient operation
1. Deep-sea tug:			
(a) Handling oil and water barges	0-2	2-4	>4
(b) Towing oil and water barges	0-4	4-6	>6
(c) Handling derrick barge	0-2	2-3	>3
(d) Handling and towing L.S.T.	0-3	3-5	>5
2. Large crew boats (>90 ft.):			
(a) Loading or unloading crews at platform	0-3	3-5	>5
(b) Loading or unloading crews at tender	0-4	4-7	>7
3. Average crew boats and luggers used for crew transportation (60 to 90 ft.):			
(a) Under way	0-8	8-15	>15
(b) Loading or unloading crews at platform	0-3	3-5	>5
(c) Loading or unloading crews at tender	0-4	4-7	>7
4. Supervisor's boats (small, fast craft, 40 to 50 ft.):			
(a) Under way at cruising speeds	0-2	2-4	>4
(b) Loading or unloading crews at platform	0-2	2-4	>4
(c) Loading or unloading crews at tender	0-2	2-4	>4
5. L.C.T. and cargo luggers:			
(a) Under way	0-4	4-5	>5
(b) Loading and unloading at platform	0-3	3-4	>4
(c) Loading and unloading at tender	0-4	4-5	>5
6. Large amphibious aircraft (PBY):			
(a) Sea landing and takeoff	0-1.5	1.5-3	>3
(b) Boat-to-plane transfer operations in water	0-1	1-2	>2
7. Smaller amphibious aircraft:			
(a) Landing and takeoff	0-1	1-2	>2
8. Chain handling (using ship-mounted derrick or large derrick barge)	0-2	2-3	>3
9. Buoy laying (using small derrick barge)	0-2	2-3	>3
10. Lifting substructure (using ship-mounted derrick or large derrick barge)	0-2	2-3	>3
11. Platform building:			
(a) Using ship-mounted derrick	0-4	4-6	>6
(b) Using large derrick barge	0-3	3-5	>5
12. Pipe-line construction	0-3	3-4	>4
13. Flowing oil into barges	0-4	4-5	>5
14. Unloading casing (using derrick on tender)	0-3	3-4	>4
15. Driving conductor pipe (using derrick on tender to handle pipe)	0-3	3-4	>4
16. Gravity-meter exploration (limiting conditions caused by instrument becoming "noisy")	0-4	4-6	>6
17. Seismograph exploration (limiting conditions caused by crew danger)	0-6	6-8	>8

*It is emphasized that these data represent a generalization of experience acquired by a number of operators. The height limits will vary depending on a number of considerations such as wave period (whether wind wave or swell), wave direction, simultaneous wind conditions, currents, actual equipment and experience of personnel involved, etc.

TABLE 2*

	Department						
1949 dates	Supt.	Asst. supt.	Pet. engr.	Civil engr.	Farm boss	Trans. foreman	Other
February	6	9	6	20	27	26	10
March	11	6	5	1	19	28	9
April	7	1	4	13	25	26	7
May	29	25	4	7	11	1	5
June	21	28	2	2	20	3	4
July	24	41	12	1	2	1	5
August	36	35	14	9	2	7	5
September	43	44	13	11	15	9	5
October	39	18	20	5	22	2	6
November	20	20	23	4	20	10	5
December	21	17	29	14	24	16	1
1950 date							
January	10	14	18	16	31	8	3
Total	276	258	150	103	218	137	65

*The importance of discussion of individual weather problems, as contrasted to the use of "formal" forecasts and advisories, is shown by this log of the number of requests for specialized wave or weather information made by various personnel of one production organization operating offshore. These requests for specialized information are in addition to the routine twice daily forecasts and short-range weather warnings.

tinuous periods ranging from 16 to 28 months.

Of the problems mentioned in the title, the only one now considered solved within the limitations of the state of the science is that of wave forecasting. Concerning attack of the other problems, extensive wave, wind, tide, and current data; files of research reports and bibliographies pertaining to the gulf; and performance data on marine equipment, and meteorological - oceanographic instruments have been acquired during the 3-year operation of this forecasting service and corollary projects. The important conclusions reached in the acquisition and analysis of these data can only be summarized briefly in this paper. Some of the more significant results from the standpoint of coastal oil operations follow.

Combined use of the 15,000 (as of April 1950) detailed wave and wind observations obtained to date from offshore rigs, the 19-month record of wave periods obtained from an automatic recording wave gage mounted on an offshore rig, and the 100,000 (approximately) generalized wave observations for the Gulf of Mexico available through government sources now permits an accurate evaluation of the expectancy of various wave conditions at offshore locations along the Gulf Coast. Techniques developed to use these extensive data proved inaccurate and rendered obsolete in late 1948 the initial study on adaptation of wartime forecasting techniques for the Gulf Coast by Bates and Glenn[17] and recent efforts to resurrect these techniques by Horrer[18] and Krick.[19]

Performance Data Acquired

In the platform-design problem, performance data on vessels and platforms in hurricanes and tropical storms of various intensities have been acquired. Also wave height and period and simultaneous wind records have been obtained at offshore platforms in one tropical storm using an automatic recording wave gage and a recording anemometer and visual observations, and in one hurricane using visual observations and a direct-reading anemometer. In addition, a tide gage on an offshore rig now maintained in connection with the forecasting service has provided records over an extended period including one tropical-storm situation.

Results of immediate interest stemming from analysis of these data and experience with these instruments are, first, that contrary to assumptions made in the design of offshore drilling platforms, storm tides resulting from a tropical disturbance can be as high at locations several miles offshore as those occurring at the coast. Also, the use of recording wave gages on offshore platforms to obtain records of maximum wave conditions in hurricanes is unlikely to provide usable results within a reasonable period of time. Instead the most promising approach to this important problem and the one likely to provide immediate results appears to be the use of airborne swell recorders on hurricane reconnaissance aircraft operating on low-level sorties in the gulf.

Turning to the tide problem, the variation of astronomical tide in the gulf has been known quantitatively for years. A number of references on this work are included by Geyer.[20] Less known is the quantitative effect of wind on tides on the shallow Continental Shelf of the gulf. A survey in 1948[21] turned up 40 research papers on this subject of wind effect on tides in the international oceanographic literature, and through use of these and comparison of astronomical and observed tides at several tide gages in the delta area for varying periods since June 1948, an approach to the problem of predicting wind tide has been made. One operational use of this work is described earlier in this paper.

Currents in the Gulf of Mexico, particularly around the Mississippi Delta, are subject to a number of complex controls: the "large scale" current regime in the gulf, winds, river outflow, tides, in unusual cases, precipitation; and possibly as one exasperated scientific observer put it,

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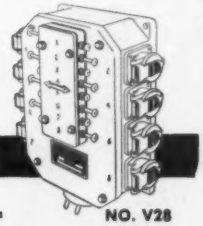

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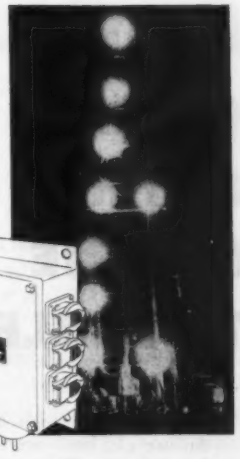

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"The propwash from pelican's wings." Currents have important implications in problems of scour, pollution, design of holding tackle for offshore equipment, boat and barge handling in open water, sedimentation, and wave forecasting. An intensive program was commenced in May 1949 under the direction of A. H. Glenn and Associates to study the current regime in a coastal region, both inshore and offshore, under selected wind, tide, and river stage conditions. This program is not yet completed and conclusions derived from it are premature. It should be pointed out, however, that one of the primary obstacles in a program of this type is development of instrumentation. Standard "deep sea" oceanographic instruments and techniques are for the most part ineffective in working in coastal areas of the gulf.

Current measurements have been made in the vicinity of a number of offshore rigs in the delta area in connection with wave forecasting problems. In addition, Geyer[22] has studied salinity conditions west of the delta and movement of water masses through analysis of salinity data acquired on offshore rigs.

Operating limits of equipment under various wind, current, wave, and tidal conditions have been studied in detail and certain generalizations on these studies are shown in Table 1. Knowledge of such performance data combined with accurate climatological studies of wave conditions has permitted detailed planning studies.[23]

Acknowledgments

The author wishes to thank W. W. Hildreth, Jr., for compilation of data included in Tables 1 and 2 and personnel of a number of companies for kindly furnishing data summarized in Table 2.

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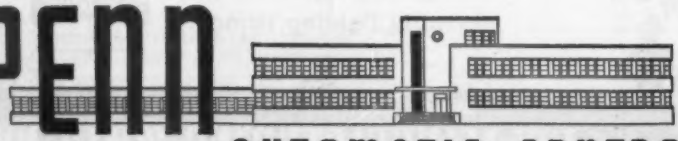

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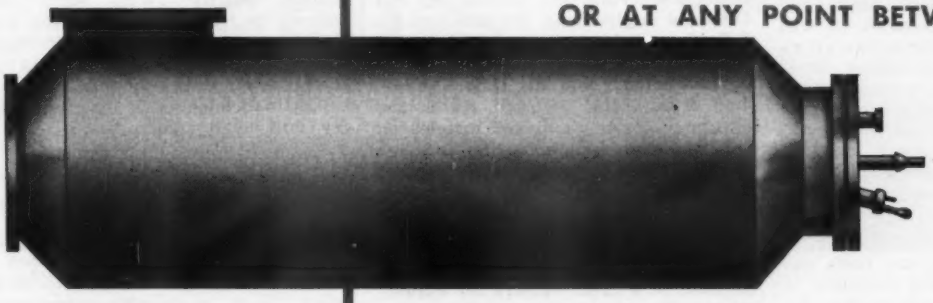

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The Gulf Coast in the Next 25 Years

by Harold Vagtborg

IT has long been realized that real wealth is created solely by the processing of natural resources. It is the processing of the products from the wells, the fields, the mines, the forests, and the oceans, and the subsequent upgrading of these through manufacturing operations, that makes an area or a nation strong economically. **Few areas in the world have the variety of natural resources enjoyed by the Gulf Coast area,** and it is interesting to realize that all of the basic natural resources previously referred to have in the past, or will in the future, contribute to the area's economic development. Other areas in the nation have a preponderance of one or two sources of natural materials and their opportunities in the future, although good, will be limited to the further development of these, particularly through the technological process.

Harold Vagtborg is president, Southwest Research Institute, San Antonio. Prior to this connection he was president and director of Midwest Research Institute, Kansas City. Vagtborg's special fields are hydrology, hydraulics, and chemical engineering. He received his B.S. degree from University of Illinois, his M.S. from Armour Institute of Technology, and his D.Sc. (honorary) from Park College. He is the author of many published articles on industrial research, scientific research institutions and research management, as well as numerous technicial papers in journals of the national scientific societies.

As people of the world, and as people of this nation, we have extended our geographical frontiers to the limit. The world population increases at the rate of approximately 250 million people every 10 years, and we begin to realize more than ever that the increasing wants of these people now and in the years ahead on a decreasing per capita land area, can only be met through the process of technology which is the only multiplier of our natural resources. We have seen enough of the fruits of science, in its ability to produce more and more from less and less, to feel confident that for untold generations ahead all of the material wants of man can be met.

Gulf Coast Petroleum

In recent years we have observed the phenomenal development of the Gulf Coast area, particularly in the petroleum and petrochemical industries. As a matter of fact, this development has been so rapid as to have directed the attention of many people from many other natural resources which the area possesses. In the next 50 years we will not only see continued growth in the petroleum industry, but will likewise see great development in mining, forest, and agricultural operations. In addition, we will see development of the use of the Gulf of Mexico not only for transportation and offshore drilling, but also for the production of food.

Considering the mining possibilities, new exploration methods will develop which will reveal valuable mineral deposits of a great variety for exploitation. The Gulf Coast and nearby areas are already a great source of supply for sulfur, phosphate, iron, potash, titanium, tripoli, manganese, glass sands, novaculite, and bauxite, as well as a great variety of clays suitable for all types of ceramic and burned-clay uses. Some of these materials are just coming into their own, and many will undoubtedly follow as exploration methods are further developed. It is particularly important to realize that the unusual variety and quality, as well as quantity, of Gulf Coast area clays, coupled with available natural gas, will inevitably lead to substantial development of ceramics and clay products industries.

In connection with many forms of inorganic substances, which exist in great quantity and are easily processed, it is inevitable that these will find greater and greater uses, particularly where organic substances develop higher values. Too many of us forget that when synthetics were introduced, there was the feeling that these would quickly replace many materials made out of inorganics, but the history has been that organic substances often "price themselves out of the market" because of the great variety of entirely new applications and needs they fill. It is interesting to note the relatively recent awakening of many of the industries dealing in inorganics to their potentialities through research, and the next 50 years will see these industries grow very substantially.

Oil Industry Widening

In recent years we have seen a rapid shift in the petroleum industry from the production of fuels and lubricants almost exclusively, to the production of tremendous quantities of petrochemicals as well. This shift is only the first step of the further inevitable development in the years ahead of the so-called petroleum industry to that of a hydrocarbon industry. It is noteworthy that more and more of the petroleum operators are thinking in terms of the processing of hydrocarbon resources, and they are evidencing more and more interest in the processing of natural gas, and intermediates from crude oil. Some have already made substantial research investments in these other hydrocarbons as long-range considerations of their processing when economics justify. With such vast sources of hydrocarbons in the Gulf Coast and with the great increases in our petroleum reserves and the forthcoming developments in recovery, it is inconceivable that the industry will ever wane.

The substantial attention that the industry is giving to exploration and production is a good omen. It is probably true that there are more promising new methods of exploration today than there have ever been in history and more will undoubtedly come. Much, of course, needs to be done to develop some of these for practical and economical uses, but as our knowledge of science continues to increase, we will learn ways and means of ascertaining petroleum reserves with greater and greater accuracy and in all types of formations.

Because of the great depths now required to tap some of our best reserves, a great deal of attention has been given to better and lower cost methods of drilling. Of particular note in this connection is the substantial fund available for research through Drilling Research, Inc., Houston, which has been established by a number of petroleum industries to find new ways of getting a hole in the ground at lower cost. Of much interest at the present time is the percussion-drilling method suited to great depths, which utilizes the mud column as an energy source. This method shows excellent promise, particularly in very hard formations, although there is no reason to believe that it will not bring substantially increased rates of penetration through all forms of strata.

The relatively recent formation of the Offshore Operators' Committee, to more rapidly secure answers to problems common to all companies in offshore operations, will give a great impetus to the development of economical methods of utilizing the great oil reserves under the gulf. As

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new methods and techniques are developed, we will see increasing activity in the gulf, and at the same time without harm to any other industry or segment of our population.

Anyone who is concerned about existing and contemplated gas-transmission lines need only plot these on the map of the United States and in noting their proximity at certain points to our great coal and lignite deposits, will realize that we are building an enduring system which connects our great centers of population and industries with Gulf Coast sources of gaseous and liquid fuels.

One of the greatest assets that the Gulf Coast has is its agricultural lands which enable the production of an unusual variety of crops, both for food and industrial raw materials, because of the great variations in rainfall across the area and the long growing seasons. And, it is well to point out that probably the greatest development along the Gulf Coast area in the 50 years ahead will be in the production of consumers' goods. It must be remembered that most of the great Gulf Coast plants recently installed are producing intermediates which only give the area the benefits of the first step in the processing of natural resources into consumer goods.

OCEAN WAVES

(Continued from page 220)

would indicate the maximum height of the storm tide.

Regardless of whether or not wave heights may be properly forecast or calculated, there is one oceanographic tool which is becoming an accepted part of marine engineering work. This is the refraction diagram which shows localities where a given set of deep-water ocean waves will build up or converge and other localities where the same waves will be reduced or diverge. These diagrams make use of wave characteristics, bottom topography, and water depth. Those constructed in the past have been referred to mean sea level. However, information on convergence and divergence is most vital at the time when a hurricane strikes. At such a time the general sea level near shore is considerably higher than mean sea level and refraction diagrams should take this into account. Apparently they do not do this now.

Before refraction diagrams can be drawn, the periods and directions of waves which occur in deep water must be known. Upon this information and upon detailed bottom topographic charts, wave-refraction diagrams are based. At the present time each company which wants a refraction diagram must pay for the complete recomputation of these statistics although the information is exactly the same for all locations in a given region. If the industries concerned were to sponsor jointly, once and for all, a careful compilation of hurricane statistics, then refraction diagrams for proposed new drilling sites could be constructed with relatively little effort and cost.

From what has been said, it can be concluded that the needed information about hurricane waves on the Continental Shelf of the Gulf Coast can be obtained only by a thorough theoretical and empirical study integrated with an over-all oceanographic research and forecasting program. If the study is properly organized many interesting agencies will contribute to its progress.

The oceanographic problems of the Gulf Coast are well defined and the only satisfactory means for attacking them is agreed upon by all who are trained in this field of work. Texas A. & M. College has taken large steps in initiating these major undertakings. The college administration feels that they may in this way contribute to the general welfare of the region and to the economic and cultural development related to one of our greatest natural resources, the Gulf of Mexico.

Acknowledgment

Appreciation for constructive criticism and for suggestions related to this discussion from Drs. Walter Munk and Robert Arthur of the Scripps Institution of Oceanography, Joseph Caldwell of the U. S. Army Engineers Beach Erosion Board, and A. H. Glenn and C. C. Bates of A. H. Glenn & Associates is gratefully expressed.

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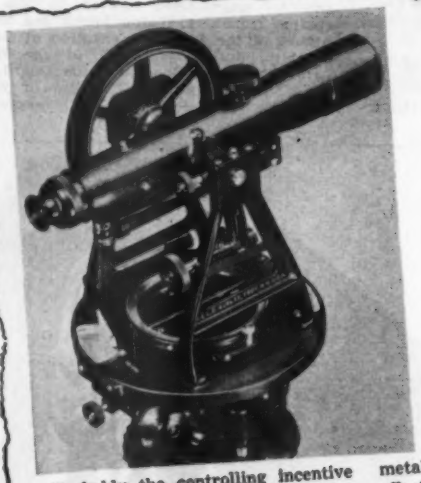

Gurley Instruments

An article describing the advantages of aluminum construction of Gurley instruments where accuracy, strength, lightness and freedom from vibration are essential.

Probably the controlling incentive in the application of aluminum alloys to surveying instrument construction has been the prospect of weight reduction. Consider the labor to be saved by a surveying party which has to carry these instruments about, day after day, often over rough country, when the weight can be reduced by at least one-third.

A comparison of the mechanical properties of the aluminum alloys with those of the other non-ferrous alloys commonly used in the making of surveying instruments is greatly in favor of the light weight metal. The remarkable feature of these strong aluminum alloys is their high yield point in relation to their ultimate strength, especially those in the fully heat treated condition. They are also very rigid and hard.

Some aluminum alloys are suitable for die-casting. Special bearing metals can be inserted in the molds and cast integral with the structural parts. In no other way have bearing metals and structural metals been so effectively and economically combined. A further result of the use of aluminum alloys through this method of manufacture is a decrease in the number of parts. Minor assemblies have been combined into single parts, permitting more accurate manufacture and insuring a permanence of adjustment of these parts in service. The latter feature is doubly true, since the aluminum alloys differ from other materials of instrument construction in that they do not "grow" nor distort with age.

The non-corrosive and non-tarnishing qualities of aluminum furnish added inducements to their application in the construction of precision instruments. This has led to their substitution for silver on accurately graduated circles and verniers. Burnished aluminum does not blacken when in contact with sulfurous gases frequently found in the atmosphere of mines and industrial districts.

Tests with transits made from aluminum alloys have shown, not only greater structural strength and durability, but greater stability under conditions which induce vibration. That this should be so is readily apparent, since the light weight greatly reduces the momentum of the instrument and consequently the amplitude of vibration.

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QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Viscosity of Residues Of Crude Oils

How can we estimate the viscosity of topped crude oils or residuums from crude oils? We need this in estimating cracking yields.—J. B. M.

The viscosity of heavy lube fractions or residuums can only be estimated from vacuum distillations and not many of such analyses are available in the literature. However, in the third edition of Petroleum Refinery Engineering, Fig. 16, is shown the viscosity of fractions at 100° and 210° F., from true-boiling-point distillations. Similar charts are shown on this page (Figs. 1, 2, and 3) but for residues rather than fractions (which do not extend to 100 per cent). They were obtained from a correlation of over 108 T.B.P. analyses. These charts are an improvement over the figure in Petroleum Refinery Engineering because they are stated in terms of characterization factor rather than just the base of the crude oil. The general relationship between "base" and "characterization factor" is:

Pennsylvania stocks	12.2-12.5
Mid-Continent—light or green	12.0-12.2
Intermediate base	11.8-12.0
Intermediate naphthene and naphthene intermediate	11.4-11.8
Naphthene or asphalt base	11.1-11.4

Thus, it is possible to distinguish carefully among the different types of crude oils.

Although boiling points are not always available, they can be estimated from the A.P.I. gravity and characterization factor:

$$K = \frac{(\text{B.P.} - {}^\circ\text{F. Abs.})^{1/3}}{\text{sp. gr. } 60^\circ \text{ F.}}$$

or from other general relations such as viscosity index, viscosity gravity constant, etc. Such relationships were published on this page in the March 23, 1950, issue.

Another means of obtaining the viscosity of viscous fractions or residues are the several charts first published by Universal Oil Products Co. *(Egloff, et al, The Modern Cracking Process, The Oil and Gas Journal, July 2, 1936, page 34)*. These charts relate A.P.I. gravity, boiling point, and characterization factor, to the kinematic viscosity in centistokes.

Results by the two methods do not check and hence the results by either method must be used with caution.

Heating Value of Petroleum Coke

What are good values for the heating value of coke?—S. M. T.

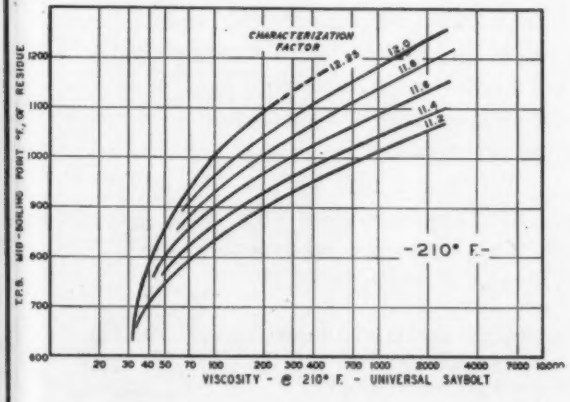
Cokes that are very low in volatile matter such as those that have been calcined or produced in an oven, appear to consist largely of carbon throughout which is dispersed a small amount of hydrocarbon material. Thus, the heating values are closely related to the heating value of carbon (14,500 B.t.u. per lb.). This persists up to about 10 per cent volatile matter.

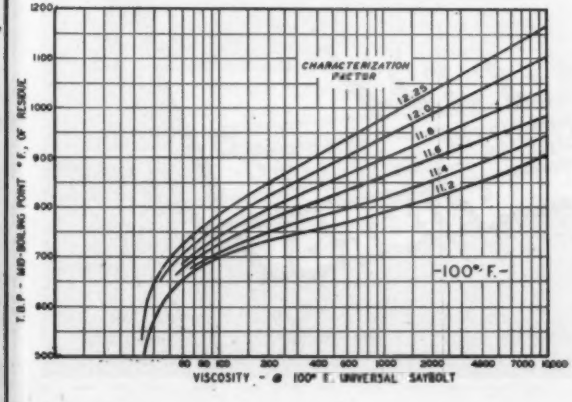
Above about 10 per cent volatile matter, the coke apparently consists almost totally of hydrocarbons, and the heating value abruptly changes as shown in Table 1.

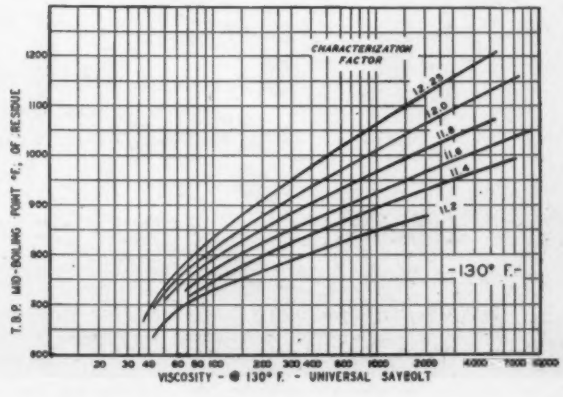
TABLE 1—HEATING VALUE OF COKE ON AN ASH AND MOISTURE-FREE BASIS, B.T.U. PER LB.

Per cent volatile matter	Gross H.V.
0	14,500
2.5	15,050
5.0	15,590
7.5	15,980
10.0	16,100
15.0	16,150
20.0	16,180
25.0	16,220
30.0	16,250

Ash may range up to even 2.5 per cent for the calcined cokes (more often 1.4 per cent), and mosture up to 3.5 per cent but usually under 1.5 per cent.







Figs. 1, 2, and 3—Approximate Universal Saybolt viscosity of crude-oil residues at 210°, 100°, and 130° F.

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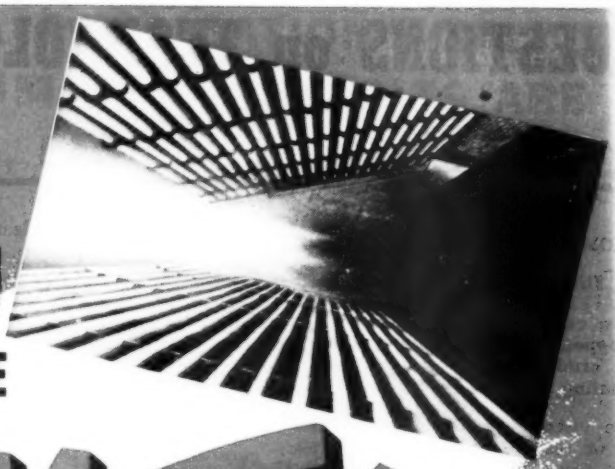

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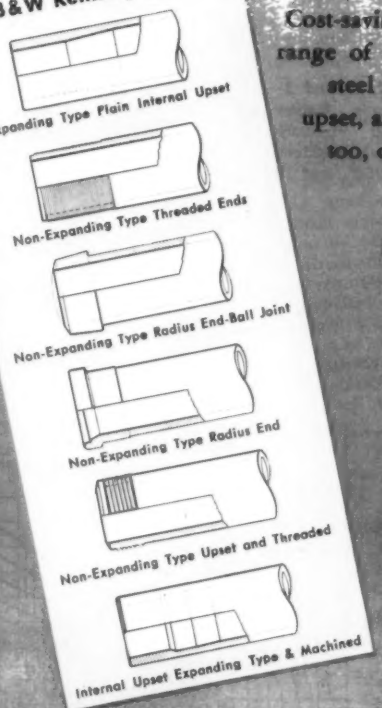
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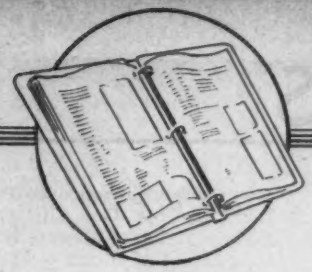

THE REFINER'S notebook

Pneumatic Controllers

ACCORDING to the terminology established by the Industrial Instruments and Regulators Division of the A.S.M.E. an automatic controller of regulator is "a mechanism which measures the value of a variable quantity or condition and operates to correct or limit deviation of this measured value from a selected reference. It includes both the measuring means and the controlling means."

Self-operated.—The simplest type of controller is the self-acting source of energy (such as compressed air, hydraulic, or electric power) to operate the final control element. The energy for this purpose comes only from the controlled medium. A self-acting temperature control may consist of a thermometer bulb and a bellows unit whereby the vapor pressure of the liquid in the bulb is balanced against a spring to open or close the inner valve. Another example of a self-operated control is the pressure balanced diaphragm air or gas regulator.

Relay operated.—A relay-operated controller uses outside power to supplement or amplify the energy coming from the controlled medium through the primary element. In pneumatic control systems the pilot or relay valve may be mounted directly over the power unit which positions the inner valve or may be mounted on a panel board. Fig. 1 illustrates the basic operating principle of a controller using air as the actuating medium through a relay valve which is placed downstream of a restriction in the air supply line. Air relay valves are made in many forms and may be of the bleed or nonbleed types. (For a full discussion of pneumatic controller mechanisms see "Instruments and Process Controls," publication of New York State Vocational Association, Delmar Publishers.)

Proportional control.—Essential action in a pneumatic controller is obtained through the air jet issuing from the nozzle and moving a flapper, baffle, or valve which through suitable linkage and a feedback bellows or other service varies the output pressure to the pneumatic diaphragm of the valve power unit. The amount of air leaving the nozzle is varied by means of the relay valve.

Assume a change in the temperature of the reboiler vapor such that through the action of the bourdon helix and linkage, the flapper is actuated to cover the nozzle. This means an increase in back pressure in the nozzle line to the relay valve. Some of the increase in the relay output pressure is relieved through the feedback bellows which has a follow-up action moving the flapper in the opposite direction. The net effect is to obtain an increase in controller output pressure to diaphragm of the valve power unit which is in proportion to the deviation of the reboiler vapor temperature from the desired value.

Valve positioners.—These make available maximum force for positioning the inner valve at small changes in controller output pressure. They consist of a pilot or relay valve and mechanical linkage to the valve stem, and act to apply full air pressure from their supply system on the diaphragm or to bleed air when operating in the reverse direction, as presently available pneumatic valve positioners provide a reliable means for reducing hystersis error in the power unit. Their use is in general indicated with wide (greater than 10 per cent) proportional band and with large valve sizes.

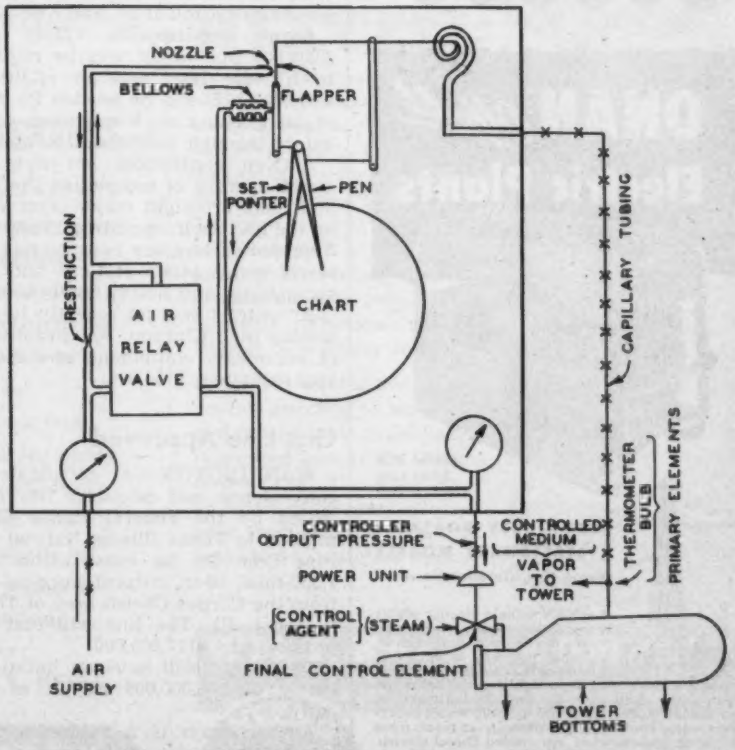

Fig. 1—Schematic illustration of pneumatic proportional controller action.

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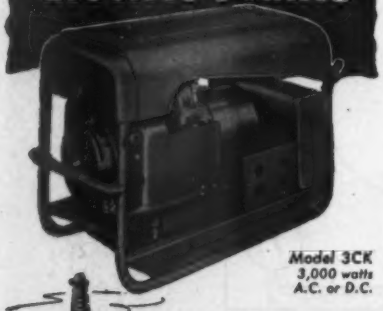

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PIPE LINES

Progress Report

Mid-Valley to complete 120-mile section soon

ST. LOUIS.—Mid-Valley Pipe Line Co. (Sun and Sohio) announced last week that a 120-mile section of its Texas-to-Ohio crude-oil line will be completed this month and in operation the first week in July.

E. F. Morrill, vice president of the firm, said that this is most of the northern part of the 1,000-mile line. The entire system is expected to be completed in October, and Morrill reported that approximately 50 per cent of the pipe has been laid.

Two construction crews of Mahoney Contracting Co. are laying north from Cincinnati and south from Lima, and this section will soon move crude to Sohio's refinery in Lima.

The 120-mile section from Haynesville, La., to Mayersville, Miss., is now operating, carrying crude from producing fields to storage tanks at Mayersville.

Morrill said 89 per cent of the pipe for the 20 and 22-in. line already has been delivered and the remaining pipe is now being rolled for early delivery.

Large requirements. — More than 2,000,000 bbl. of oil will be required to fill the line, and an additional 1,000,000 bbl. will be needed for minimum working stock in storage tanks before through traffic can be started.

Sixteen contractors are now engaged in work of completing the line, and there are eight major contractors on the line itself, operating 12 spreads. Five contractors are constructing the seven major pump stations and two substations, and houses for personnel.

A contract was let recently to Motorola, Inc., Chicago, for installation of microwave equipment, at a cost of approximately $750,000.

Gas Line Approved

WASHINGTON.—A certificate of convenience and necessity has been issued by the Federal Power Commission to Texas Illinois Natural Gas Pipe Line Co. for construction of a 1,300-mile, 30-in. natural-gas pipe line from the Corpus Christi area of Texas to Joliet, Ill. The line will cost approximately $117,000,000.

The artery will have an initial capacity of 305,000,000 cu. ft. of gas daily.

Authorization is a culmination of efforts of a group of Tulsa men who organized Gulfcoast Northern Gas Co. last year for the purpose of constructing the line, to supply added natural gas to the Chicago metropolitan area.

In April, Gulfcoast Northern completed a transaction with Peoples Gas Light & Coke Co., Chicago, for formation of Texas Illinois Natural Gas Pipe Line Co. Stock of Texas Illinois was divided equally among stockholders of Peoples Gas and Gulfcoast Northern. Later, Gulfcoast Northern was dissolved and its stockholders became stockholders of Texas Illinois, with a half interest in that company.

Southern Lets Contracts

BIRMINGHAM.—Southern Natural Gas Co., which recently received Federal Power Commission authorization to construct additional pipe-line facilities on its natural-gas system, has let contracts for a total of 236 miles of lines.

Sheehan Pipe Line Construction Co., Tulsa, has been awarded contracts for 24 miles of 24-in. loops in Mississippi, Alabama, and Georgia; 180 miles of 18-in., from Gwinville, Miss., to Selma, Ala.; and 32 miles of 16-in., from Elmore Compressor Station, to Mitchell Village, Ala.

The construction company has assigned Jim and R. H. Brown as spreadmen, with field offices located at Yazoo City and Meridian, Miss.; Wetumpka and Lincoln, Ala.; and Carrollton, Ga.

West Texas Lines Planned

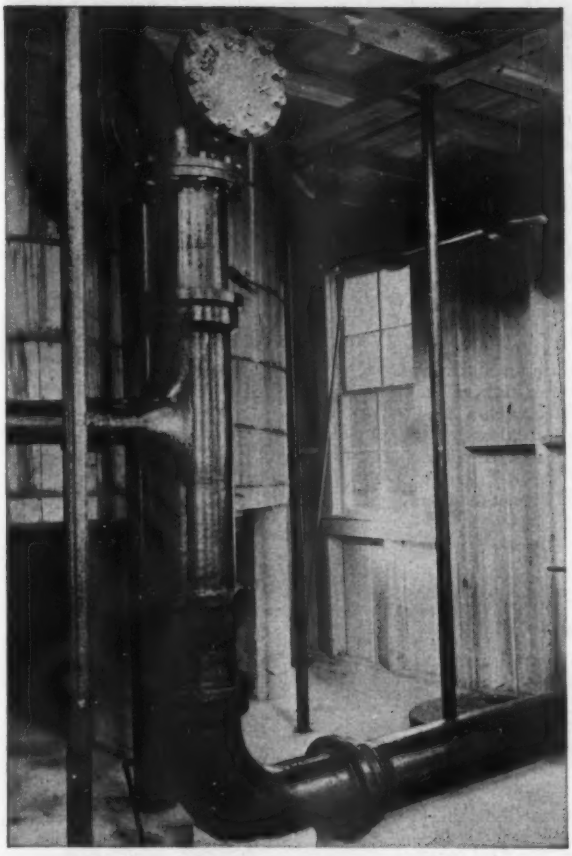
Humble Pipe Line Co. has asked for bids on 30 miles of 8-in. line from its Ballinger Station to the Fort Chadbourne pool of Runnels and Coke counties, West Texas, to handle oil presently being trucked from the pool.

Another line planned in this West Texas region is Gulf Refining Co.'s 6-in. gathering system in Kent County. This system will serve the production recently opened by the Caroline Hunt Trust Estate 1 J. W. Young, 30 miles north of Gulf's present Scurry County gathering system. Delivery will be made in the Kelley-Snyder pool and the 10-in. line running to the Roscoe Station, and subsequently to the Gulf Coast.

Magnolia Pipe Line Co. plans to increase its capacity out of Scurry County by 14,000 bbl. daily to a total of 94,000 bbl. by looping part of its 12-in. line between the Iatan Station and Corsicana terminal. Loops will total approximately 47 miles.

Associated Line Approved

WASHINGTON.—The Federal Power Commission has granted Associated Natural Gas Co., Tulsa, to construct natural-gas pipe-line facilities in southeastern Missouri, which will



DIRECT ROUTE TO LOWER PLANT MAINTENANCE

The direct and indirect expense of replacements of short-lived refinery pipe lines can be reduced, or avoided altogether, by the use of cast iron pipe. This has been proved by many refineries whose maintenance costs have been lowered by replacing other pipe materials with cast iron.

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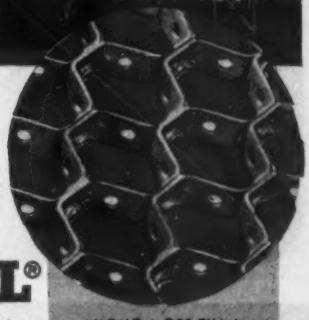

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serve the Sikeston and New Madrid areas from a connection with Texas Eastern Transmission Corp.'s line near Oran, Mo.

The project will cost approximately $934,000, and will include 14½ miles of 8⅝-in. line from Oran to Sikeston, and 21 miles of 6⅝-in. line from Sikeston to New Madrid.

Transco Seeks Extension

WASHINGTON. — Transcontinental Gas Pipe Line Corp., Houston, has asked Federal Power Commission to authorize an 11-mile extension to its main pipe line to provide an auxiliary connection for delivery of natural gas to the New York metropolitan area.

Cost of the construction is estimated at $3,585,082. The line would consist of pipe from 20 to 26-in. in diameter, and would run from Transcontinental's main line near East Carteret, N. J., to a point in the Bay Ridge section of Brooklyn.

Pipe-Line Flow Declines

WASHINGTON.—A report released last week by the Interstate Commerce Commission réveals that the volume of crude and refined products handled in pipe lines declined the first quarter of this year. However, revenues were up.

Total volume of 47 companies reporting to ICC was 566,784,851 bbl., down 6.2 per cent from the first quarter in 1949. Revenues totaled $89,962,554, up 6.5 per cent over the same period last year.

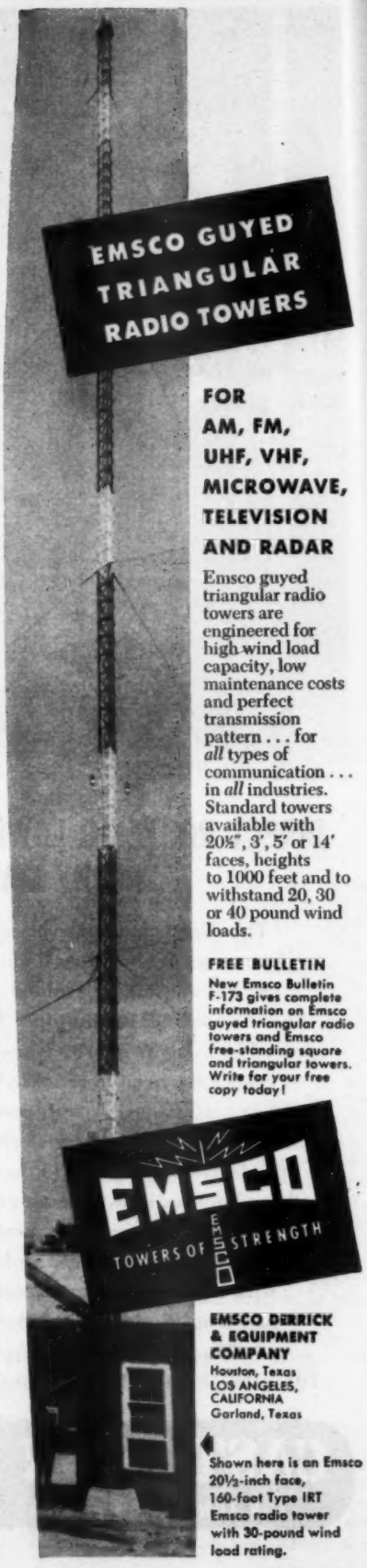
Humble Pipe Line Co. handled more volume than any reporting company. It transported 49,544,888 bbl., 27 per cent less than it handled during the same period a year ago. Stanolind (now Service) Pipe Line Co. handled 39,426,229 bbl., and Interstate Oil Pipe Line Co., 40,279,540 bbl.

Stanolind earned the most for transporting in its lines, $10,498,931, and Wyco Pipe Line Co. reported the largest percentage increase in volume. It moved 57.3 per cent more, or a total of 1,103,569 bbl.

Tennessee Gas Project

HOUSTON.—Latex Construction Co. announced last week that work will start July 1 on a 95-mile 20-in. spread from Natchitoches to Kinder, La., for Tennessee Gas Transmission Co. Headquarters have been established at Kinder, La., with F. A. Siler as superintendent and C. V. Oliver as office manager. Work will start on a 105-mile 16-in. section for that firm from Kinder to Bayou Sale, La., around June 15.

Work is now under way on a 123-mile 30-in. gas line for Tennessee Gas, 90 miles of which is from West Monroe, La., to near Many, La. *(The Oil and Gas Journal, May 18, 1950, page 171.)*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• The new Beaver No. 26-R "fully-adjustable" pipe threaders are better because:

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3. The Beaver 26-R is the only 1 to 2-inch threader on the market which will cut either standard "taper" or electric "straight" conduit threads.
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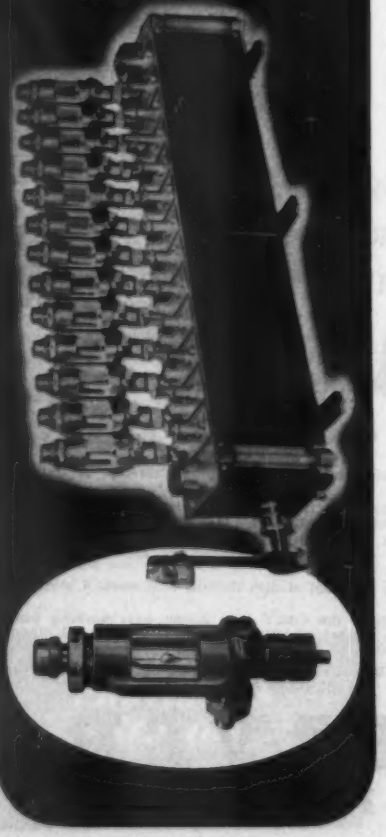

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Montana-Dakota Line

MINNEAPOLIS.—H. M. Frederickson, assistant vice president of Montana-Dakota Utilities Co., said last week that Conyes Construction Corp., which has contract for construction of a 335-mile, 12¾-in. natural-gas line from Worland, Wyo., to Baker, Mont., is "well under way" with work on the project.

The line is being built by Montana-Wyoming Gas Pipe Line Co. and will be leased to Montana-Dakota Utilities, Frederickson said. Al Poggi is superintendent of the work for Conyes, and field offices are currently located at Hardin, Mont.

22-Mile Connection Planned

WASHINGTON.—A 22-mile, 16-in. connection between two points on Ohio Fuel Gas Co.'s existing natural-gas transmission system has been proposed by the company, and a request for its approval has been filed with the Federal Power Commission.

The line, near Dayton, will furnish needed capacity for maintenance of service to existing markets. Also proposed is removal of the company's 330-hp. Vandalia compressor station. These changes would permit increased deliveries at wholesale to Dayton Power & Light Co. for resale in Dayton and other areas.

Estimated cost of the 22-mile line is $781,000.

Line Nearing Completion

EDMONTON.—A $448,000 8-in. natural-gas transmission line being built from Imperial, Oil, Ltd.'s gasoline plant at Devon to Edmonton by Northwestern Utilities, Ltd., is nearing completion.

The line will bring gas from the Leduc oil field into Edmonton and assist Northwestern in handling increased peak demands.

C. L. Metcalf, secretary of Northwestern, said that all work is being done by the firm's own crews.

Northwestern's $4,000,000 construction program this year includes drilling of six new wells in Viking-Kinsella field, plus connecting to the company's system two wells which already were drilled by Imperial. Metcalf reported that Northwestern is now on its fifth well in this field.

Also included in the program, to be completed during the year, are the following:

Reconstruction and redesign of the Viking field measuring station, at a cost of $100,000; construction of a transmission line to serve the town of Fort Saskatchewan and other customers en route, at a cost of $519,000; construction of a new regulating station and other facilities at the eastern limits of Edmonton and at the termination of Northwestern's three transmission lines.

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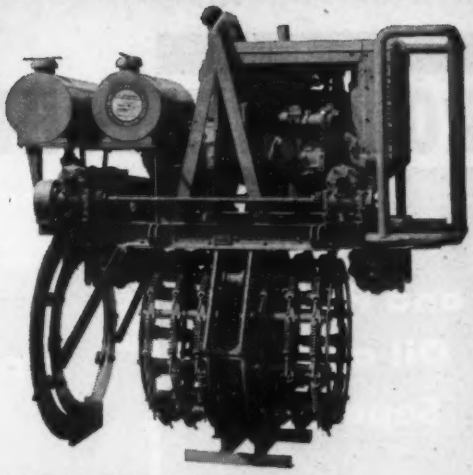

MODEL "K" PIPE CLEANING AND PRIMING MACHINE can be set up to clean and prime pipe from 16" to 26" in diameter. May be used line-traveling or on stationary base. This machine is also available for larger pipe sizes.

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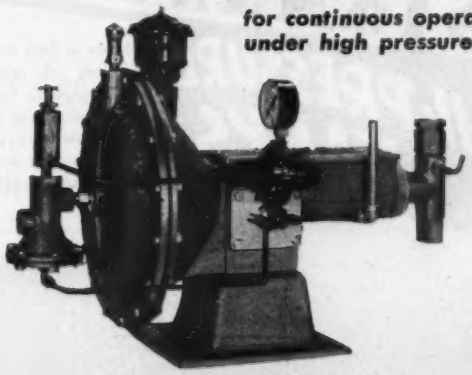

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NATURAL GAS

Natural-Gas Line Proposed

WASHINGTON. — Southeastern Michigan Gas Co., Chicago, is seeking Federal Power Commission authorization to construct and operate a 55-mile pipe line which would bring natural gas for the first time to the area in Macomb and St. Clair counties, Michigan.

The application also asks FPC to order Panhandle Eastern Pipe Line Co., Kansas City, to connect its transportation facilities with the proposed line and to sell gas to Southeastern Michigan Gas Co.

The 55-mile 12¾-in. line would run from a connection with Panhandle's system in Oakland County to Marysville, Mich., where it would connect with the existing distribution system now serving the territory. Cost of the lines, which would have an initial maximum delivery capacity of 20,000,000 cu. ft. daily, would be approximately $1,400,000.

Cities Seeking Gas

WASHINGTON.—The cities of Ripley, Booneville, and Baldwyn, Miss., have asked the Federal Power Commission to order Tennessee Gas Transmission Co., Houston, to connect its transmission system with facilities of the cities for delivery and sale of an adequate supply of natural gas.

The proposed connection, to be made in Benton County, would include a 16-mile 6-in. pipe line extending from Tennessee Gas' system to Ripley, and the 6-in. line extending 23 miles to Booneville. An 11-mile tap line would run from that point to serve Wheeler and Baldwyn.

Acme Natural Proposal

WASHINGTON.—Federal Power Commission has ordered intermediate decision procedure omitted in the proceeding involving application of Acme Natural Gas Co., Butler, Pa., for authorization to build pipe-line facilities to serve three industrial consumers in the Butler area.

Acme is proposing to serve Armco Steel Corp., Pullman-Standard Car Manufacturing Co., and Fretz-Moon Tube Co. Estimated cost of the proposed project is $884,000.

Rehearing Denied

WASHINGTON.—Petitions filed by Northern Natural Gas Co. and Independent Natural Gas Co. for rehearing of Federal Power Commission's April 28 opinion and order which denied a proposed transaction by the two companies involving sale and acquisition of natural-gas facilities in Texas, has been denied by the commission.

FPC found that "the assignments of error and grounds for rehearing set out in such petitions do not raise any questions of fact or of law not fully considered by the commission prior to issuance of its order."

Northern was proposing to acquire and operate, and Independent to abandon and sell, a compressor station in Gray County, Texas, and a 21-mile pipe line extending from the station to a connection with Northern's facilities in Carson County, Texas.

Panhandle Hearing Delayed

WASHINGTON.—A hearing before Federal Power Commission in connection with Panhandle Eastern Pipe Line Co.'s recent authorization to expand capacity of its pipe-line system in the Midwest has been delayed. It originally was to begin June 12.

FPC authorized Panhandle to construct additional facilities on its system on May 4, to enable it to transport gas it will receive from Trunkline Gas Supply Co., which on that date was authorized to build a Louisiana-to-Illinois transmission line.

The May 4 order scheduled further hearing on Panhandle's application with respect to distribution of additional gas among its present and prospective customers, and the tariff and rate level applicable to gas deliverable from Panhandle's system.

Carbon-Black Report Issued

WASHINGTON.—The U. S. Bureau of Mines has issued a report which explains how high-quality carbon black, used chiefly in rubber making, can be made by decomposing acetylene mixed with one of several other gases under pressure.

Developed during the bureau's experimental work on reducing the explosibility of acetylene under pressure, the process also yields gaseous products composed essentially of two parts of hydrogen and one part of carbon monoxide. This type of gas, produced with acetylene-carbon dioxide-hydrocarbon mixtures, is useful in the manufacture of synthetic liquid fuels from coal and for other processes requiring definite proportions of hydrogen and carbon monoxide.

Methane, natural gas, ethane, propane, and butane were among the hydrocarbon gases used in the bureau process with acetylene to produce carbon black. In addition, tests were made with mixtures of acetylene and nitrogen, helium, hydrogen, and carbon dioxide.

Operating in the absence of air, the experimental process resulted in a higher conversion of carbon to carbon black than obtainable in the commercial production of carbon blacks. Ninety per cent or more of the carbon in the test mixtures was converted and the carbon blacks appeared to be superior to the blacks made by the conventional processes. The report was prepared in the bureau's Gaseous Explosives Section, Explosives Branch, Pittsburgh, Pa., by G. W. Jones, supervising chemist; R. E. Kennedy, scientific aide; I. Spolan, physical science aide; and G. S. Scott, chemist.

A free copy of the publication, Report of Investigations 4695, "Carbon Blacks Formed by Decomposition of Mixtures of Acetylene With a Hydrocarbon or Other Gas at Elevated Pressures," may be obtained by writing to the Bureau of Mines, Publications Distribution Section, 4800 Forbes Street, Pittsburgh, 13.

New Line Planned

WASHINGTON. — Prince George's Gas Corp., Chillum, Md., has asked the Federal Power Commission for authorization to construct a 20-mile pipe line between Chillum and Rockville, Md., which would be designed to carry additional natural gas to this city's metropolitan area.

Prince George's, a subsidiary of Washington Gas Light Co., said the proposed 22-in. line would transport gas to its Chillum compressor station for delivery to the distribution system of Washington Gas Light and its subsidiaries.

The line would cost $1,360,000, and would connect at Rockville with facilities of Atlantic Seaboard Corp.

Petition Dismissed by FPC

WASHINGTON.—Federal Power Commission has dismissed Northern Natural Gas Co.'s petition for rehearing of the commission's April 26 order suspending the firm's proposed rate increase for natural-gas service which it renders.

Northern's proposed rate increase, which would have become effective on April 27, was the largest ever filed with FPC by a natural-gas company. It amounted to approximately $3,200,000 annually, or 14 per cent.

P.C.G.A. Speaker Named

SEATTLE.—Premier Ernest C. Manning of Alberta, Canada, will deliver the keynote address at the annual convention of Pacific Coast Gas Association, which will be held here July 31-August 3.

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Output of oil, gas products for conversion sets record

WASHINGTON.—Production of crude products from petroleum and natural gas for chemical conversion last year reached a new high of 4,989,906,000 lb., an increase of 1,000,000,000 lb. over the 3,900,000,000 produced in 1948, it is indicated by preliminary figures just compiled by the Tariff Commission.

Sales for the year amounted to 3,073,197,000 lb. valued at $111,579,000, the commission reported.

The figures showed that production of aromatics and naphthenes last year amounted to 1,005,493,000 lb., an increase of about 113,000,000 lb. over 1948, and sales were 777,592,000 lb. valued at $28,511,000. Production of aliphatic hydrocarbons was 3,984,413,000 lb., an increase of approximately 950,000,000 lb., and sales were 2,295,605,000 lb. valued at $83,068,000.

All of the increase in production of aromatic and naphthenic products was in miscellaneous aromatics which include aromatic distillates and solvents, sodium carbolate and phenolates, and petroleum-derived phenols. The output of toluene declined approximately 10,000,000 lb. to 348,823,000 with sales of 288,796,000 lb. valued at $8,989,000; production of xylene declined 27,000,000 lb. to 356,122,000 lb. with sales of 230,681,000 lb. valued at $6,588,000.

In aliphatic hydrocarbons, the production of butadiene dropped to 493,844,000 lb. from 661,000,000 in 1948, with sales of 476,537,000 lb. valued at $42,007,000; propane, propylene and propane-propylene mixture output increased to 1,087,333,000 lb. from 714,000,000 in 1948, and sales were 859,102,000 lb. valued at $9,737,000 against 497,000,000 lb. valued at $8,600,000.

The commission estimated that its preliminary statistics on crude products derived from petroleum and natural gas are more than 95 per cent complete. The complete statistics will be given in the commission's final report, which will be issued later in the year.

Another Platforming Unit

Johnson Oil Refining Co., Cleveland, Okla., plans to install a Platforming unit at its Cleveland refinery which will have a capacity of 1,800 bbl. daily.

Universal Oil Products Co. will be in charge of the unit's installation, which is expected to be completed and in operation by December.

Another Oklahoma refinery has announced addition of a Platforming unit. Bell Oil & Gas Co. is now installing a unit at its Grandfield plant, which will have a nominal capacity rating of 1,500 bbl. daily. It will also be in operation by December.

Independent Union Wins

BAYTOWN, Tex.—The Baytown Employes Federation, an independent organization, has again overcome opposition to retain bargaining rights for the 4,552 production workers at Humble Oil & Refining Co.'s refinery here.

The National Labor Relations Board, which conducted the 2-day election, reported the independent federation received 2,570 votes to 1,155 for the Oil Workers International Union (C.I.O.).

A total of 3,862 employes voted. Two earlier attempts by Oil Workers International to gain bargaining rights for the refinery workers failed.

A.P.I. Issues Monograph

A monograph entitled "Thermodynamic Properties of the Lighter Paraffin Hydrocarbons and Nitrogen" has been published by American Petroleum Institute.

Prepared by Bruce H. Sage and William N. Lacey, professors of chemical engineering at the California Institute of Technology, Pasadena, Calif., the monograph is a compilation of data resulting from A.P.I. Research Project 37 during the period 1930 to 1946. It includes studies of the volumetric behavior, heat capacity, latent heat of vaporization, heat of solution, and the Joule-Thomson coefficient of the pure hydrocarbons and some two-component and three-component mixtures.

Copies of the monograph, which contains 219 pages, may be obtained through Lacey Walker, American Petroleum Institute, 50 West 50th Street, New York 20, N. Y., at $7.50 each.

Refinery Strike Situation

Several refineries were affected by strikes at the end of the week. On June 19 the situation was as follows:

The Texas Co.: At Casper, Wyo. workers left their jobs for the third time this year in a dispute between the company and Oil Workers International Union (C.I.O.). They had returned May 16 under a company-union agreement and had remained on their jobs until the latest walkout.

At Lawrenceville, Ill., a Lawrence County Circuit Court denied a union appeal to dismiss a temporary injunc-

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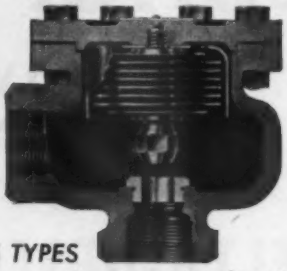

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tion which restrained the union from making certain picketing practices and instead, made the injunction permanent. Plant is operating about 70 per cent normal capacity, with approximately 50 per cent of workers on the job.

At Port Neches, Tex., Texaco opened its asphalt refinery, inviting men back to work, and a number returned, but officials of Local 228, Oil Workers International, said the strike was "still air-tight."

At Port Arthur, Tex., some union workers walked unmolested through picket lines and it was the first time that A. F. of L. men had reported for work since Oil Workers International called the strike April 4.

At Lockport, Ill., operations were running nearly 40 per cent normal, and more employes are being asked to return each week.

Quaker State Refining Corp.: Strike continues at three plants in Pennsylvania and West Virginia, with negotiations deadlocked.

New Grease Improved

NEW YORK.—Texaco Uni-Temp grease, the first product marketed to meet Army-Navy requirements for low-temperature aircraft-lubricating grease (AN-G-25 Specification), has been improved and now also meets requirements for U. S. Army instrument-lubricating grease (U. S. Army Specification 2-134). Both these specifications require that grease be suitable for a wide range of operating temperatures and have good stability, water resistance, and low evaporation characteristics.

The 2-134 specification lists additional severe requirements including exceptional resistance to oxidation in the presence of copper, and resistance to copper corrosion.

The improved Uni-Temp grease is recommended for all aircraft and all other ball, roller, or needle bearings which normally operate at wide temperature ranges (i.e., from —65° F. to 250° F. and for short periods of time, up to 300° F.). Typical applications are on surface control bearings, flexible shafts, gyro instrument rotor bearings, actuators, universals, camera bearings, and fire-control instruments which may be required to operate at wide extremes of temperature and climatic conditions.

An outstanding characteristic of the product is the quietness and smoothness of bearing operation obtained by its use.

Fungicide From Oil

NEW YORK.—Standard Oil (N. J.) announced last week that the firm's new fungicide, SR 406, described as the nearest approach yet made to a universal weapon against plant disease, is virtually out of the experimental stage and commercial production is expected to begin next year.

The fungicide was developed in the Esso Laboratories of Standard Oil Development Co., chief research affiliate of Jersey Standard, in cooperation with Rutgers University. The California Spray-Chemical Corp. has been licensed to manufacture and distribute SR 406 in the United States. Foreign distribution will be handled by affiliates of Jersey Standard abroad.

SR 406 thus far has been found effective against most fungus diseases of plants including garden, fruit and flower crops.

The new fungicide is the result of a program started by Jersey Standard some years ago.

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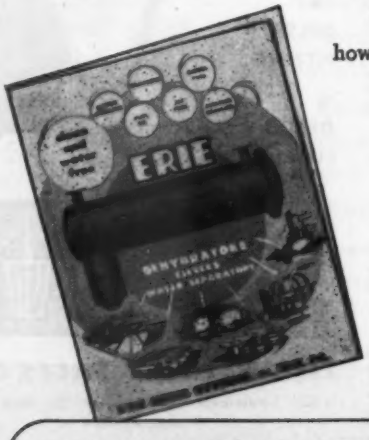

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Among the Drilling Contractors

Rig Activity Increases; 2,259 Now in Operation

Rotary-rig activity continued its steady increase last week, with a total of 2,259 in operation in the United States and western Canada. This is a gain of 6 over the previous week, and 128 more than the comparable period a year ago.

For the week ended June 12, there were 2,181 rigs operating in the United States, 3 more than a week earlier, and 126 more than the comparable week in 1949. Western Canada had a total of 78 rigs in operation, also a gain of 3 for the week, and a gain of 2 over the same week in 1949.

Although there was a total of 759 rigs running in the West Texas-New Mexico area, making it the most active region, this area showed a drop of nine over the preceding week. Total was 235 more than the same week a year ago, however.

The Gulf Coast area again showed a loss, with 482 rigs, down 14 for the week, and 103 for the same period a year ago. All other regions registered slight gains.

ROTARY RIGS IN OPERATION*
(United States and Western Canada)

Area—	June 12, 1950	Change from June 5, 1950	Change from June 13, 1949
Gulf Coast	482	—14	—103
W. Tex.-N. M.	759	— 9	+235
Ark.-N. La.-E. Tex.	148	+ 6	— 23
Oklahoma	282	+ 4	+ 62
Kansas	133	+ 4	+ 18
Illinois-Eastern	150	+ 4	+ 17
Rocky Mountain	91	+ 2	— 19
Pacific Coast	136	+ 6	— 61
Total U. S.	2,181	+ 3	+126
Western Canada	78	+ 3	+ 2
Total	2,259	+ 6	+128

*Courtesy Hughes Tool Co.

Calvert Drilling Co., Inc., last week was testing its 1 Dr. Calvert L. Jordan, 25-3n-10e, 3 miles southeast of Olney, in Richland County, Illinois. The well flowed and swabbed at the rate of 669 bbl. of oil daily from McClosky lime between 3,184-88, and 3,198-3,209 ft. Total depth is 3,210 ft. This well, which opens a new area (it is 3½ miles from nearest production) flowed 1,336 bbl. of oil the first 24 hours.

Shamrock Drilling Co., Los Angeles, has three rigs at work in the Wilmington field, near Long Beach, redrilling wells for Union Pacific Railroad Co. The wells were damaged by a small earthquake last November. **International Drilling Co.** likewise has three rigs at work redrilling quake-dam-

Crew of Cooper-Herring Drilling Co., Kilgore, Tex., shown with cementing crew on M. E. Florence Oil Co. 2 Alford in the Joinerville area, East Texas field. Top row, left to right: C. A. Mitchell, driller; Jerry Henson, derrickman; J. W. Starks, and W. C. Starks, floormen. Bottom row: M. W. Gibson, Gibson Oilwell Cement Co.; J. C. Pearcy, cementer, and B. L. (Jelly) Skaggs, tool pusher for Cooper-Herring.

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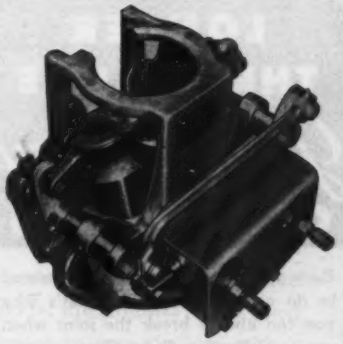

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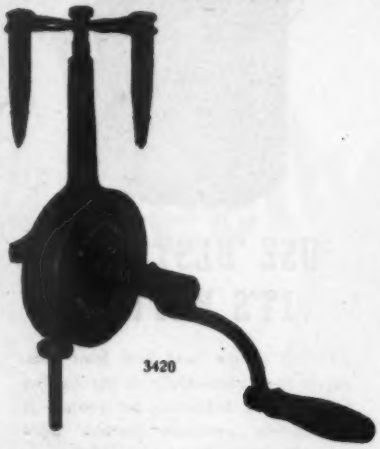

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aged producers of Long Beach Oil Development Co. This field is now the most active in California, there being some 15 rigs at work on redrilling and an additional seven drilling new wells.

Mora Drilling Co. has received contract from Wood Oil Co., Tulsa, to deepen a wildcat in the McAlester Basin of Pittsburg County, Oklahoma. The project is Wood's 1 Childers, SE NW SW 7-5n-14e, 4 miles west of the City of McAlester. Abandoned at 7,963 ft. in the Cromwell sand last year by British American Oil Producing Co., the venture is on a 13,000-acre block farmed out to Wood for the deepening job. Depth is slated at 9,500 ft., believed sufficient to cut the Wilcox sand.

George-Wrather Drilling Co. was testing last week on 1 Edward Weber, wildcat in NE NE NW 36-2s-10w, Gibson County, Indiana. The test recovered 215 ft. of oil and 30 ft. of mud on a drill-stem test at 1,873-85 ft. Total depth is 2,020 ft.

Roxie Wright Co., Houston, has contracted to drill W. H. Teel 1 M. M. Feld, 8,000-ft. wildcat test in H. Sanders Survey, Abstract 753, ½ mile southwest of Almeda in Harris County, Texas. The test is 3 miles southwest of Pierce Junction dome.

Circle Drilling Co., Lake Charles, has contracted for both a wildcat and field test in South Louisiana. The wildcat test is Niloco Co. 1 Lutcher-Moore Lumber Co. et al, 9-8s-11w, 6 miles southwest of DeQuincy, and has a projected depth of 7,000 ft. The field test is Freeport Sulphur Co. 1 Southern Sulphur Corp., in Section 28 field, 33-9s-7e, with a projected depth of 7,500 ft.

H. & M. Drilling Co. et al. have started operations at 1 Cornelison, wildcat in NW NW NW 30-29-4e, Butler County, Kansas. The test is 1 mile southwest of the Douglass pool in the southern part of the county.

Falcon Seaboard Drilling Co., Tulsa, has brought in another oil producer in the Rosenwald field, Okfuskee County, Oklahoma. The 2 Gragg, SE SE NW 23-13n-8e, flowed 20 bbl. of oil per hour at a total depth of 3,493 ft. in the Cromwell sand. The firm's 1 Gragg, NE SE NW 23-13n-8e, was cleaning out after cement job. Total depth is 3,474 ft. with 7-in. set at 3,455 ft.

Smiley - Little - Myers Drilling Co., Oklahoma City, has contract with A. C. Allyn, Jr., and D. S. Lobdell to drill a 3,600-ft. test, 1 Saunders, in NE SE SW 3-10n-7e, Seminole County, Oklahoma. Location for this step-out venture is ¾-mile northwest of nearest production in the Northwest Sylvian pool.

Anschutz Drilling Co. has finaled a 50-bbl. daily well from the Lansing lime at 3,081 ft., in the Fairport pool of Ellis County, Kansas. The test, 7 Perschnisnke, located in NE SW SE 1-13-16w, is bottomed at 3,365 ft. in the Arbuckle lime.

Heathman Drilling Co. has set surface pipe at 1 Abiram, NE NE SW 4-10-21, 1 mile north of the Teall pool in Graham County, Kansas. The wildcat is also 1 mile southwest of the Smith-Denning pool.

Grace Drilling Co., Houston, has contracted to drill J. M. Falitz 2 Dr. H. A. LeBlanc, 5,400-ft. test in the Napoleonville field, 45-12s-13e, Assumption Parish, Louisiana.

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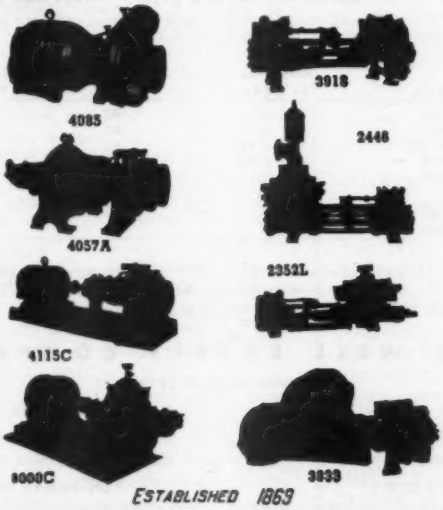

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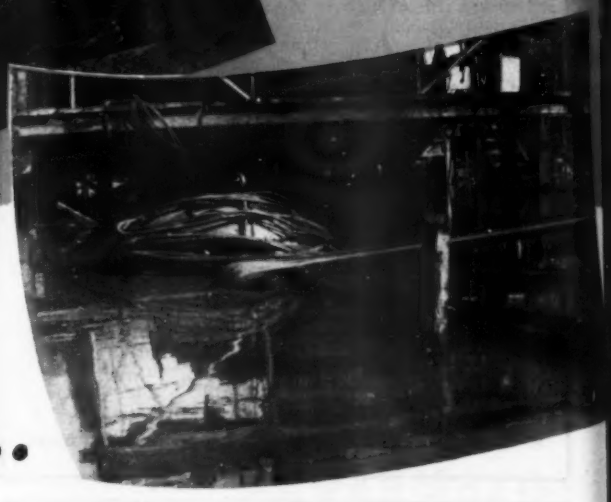
Power-end view of this "Oilwell" No. 20-P Slush Pump ready to return to service after months under water.

View of this "Oilwell" No. 20-P Slush Pump submerged in flood waters. Note the sheave, which drives the pump, barely visible above the water on extreme right hand side.



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In 1938 this pump was inspected, following a period of emergency operation when it was overloaded; but the only replacements necessary were crosshead pins and bearings. The pump continued to give excellent service with no major replacement of parts, other than such expendable fluid-end maintenance parts as, pistons, rods, liners and valves.

Under water for 6 months . . . back into service with only minor repairs necessary

Operating in Alabama this "Oilwell" No. 20-P Pump was flooded on November 24, 1948. The flood waters receded early in May, 1949 but the location was reflooded before the pump could be moved. Finally on June 1, 1949 it was removed to a shop for inspection.

The only work required to put the pump back into first class condition was, (1) the replacement of the right-hand crosshead pin and bearing, which showed signs of wear after their 10-year service, (2) inside of pump was cleaned then flushed with light oil, and (3) the lubricator was dismantled and cleaned.

"OILWELL" No. 220-P PUMPS

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No. 14P-HD	7¼" x 14"	65	325
No. 712-P	7¼" x 12"	70	220
No. 612-P	6" x 12"	70	140
No. 12-P	5" x 12"	70	100
No. 8P-HD	5" x 8"	80	85
No. 6P-HD	4" x 6"	100	40

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Old Ocean Test Closely Watched

ONE of the most closely watched wells on the Texas Gulf Coast is a wildcat currently drilling below 12,458 ft. in Old Ocean field of Brazoria and Matagorda counties. This test is Old Ocean Unit 20 Bernard River Land Development Co., Oliver Jones League, Charles Breen Survey; it has a projected depth of 15,000 ft.

At a cost in excess of $400,000, the operators of the unit will explore below the present producing horizons of Old Ocean field. The field now has five commercially productive zones, four of which are the principal producing reservoirs. Production is from the Frio sands between the approximate depths of 9,000 and 11,000 ft. Two of the four major reservoirs have a commercially important oil rim, while the other two are high-pressure gas-condensate reservoirs.

Although one of the major oil fields in the Gulf Coast, Old Ocean is also widely know for its tremendous gas reserves. It was discovered in 1934 at J. S. Abercrombie Co. and Harrison Oil Co. 1 B.R.L.D., which was completed in the Frio sand at 8,626-51 ft. The discovery of the four known major reservoirs was made by September 1938. Results at the 20 B.R.L.D. are being closely watched by Gulf Coast oil men. Discovery of a new sand would undoubtedly revive interest in deep tests in the entire area.

If pay sand is struck below 15,000 ft., the 20 B.R.L.D. will be the deepest producer in the Gulf Coast. Present record holder is Humble Oil & Refining Co. 1-B W. L. Moody, which is producing from 12,047-74 ft. Deepest production on the Texas Gulf Coast is found in South Mayes field, Chambers County.

To become the deepest well ever drilled in the Gulf Coast area, the Old Ocean test will have to exceed 17,060 ft. This was the last depth recorded by George Vasen 1 fee, Stone County, Mississippi, currently coring ahead. The previous record for the area had been 16,655 ft., established in July 1944 by Phillips Petroleum Co. 3 Schoepps, Millican dome, Brazos County, Texas.

A previous attempt has been made to explore for deeper pays in the field. In 1943, J. S. Abercrombie Co. and Magnolia Petroleum Co. 1 McDonald was spudded in for a projected depth of 15,000 ft. Trouble developed at the bottom of the well at 14,378 ft. and drilling equipment was lost and bridged the hole. It was plugged back to 11,000 ft. and is producing above that depth.

Initial development at Old Ocean was slow with only one well completed in each of the first 3 years. This was due to the fact that Old Ocean was one of the first deep, high-pressure fields. It was in these early years that the equipment and practices necessary for the drilling of high-pressure wells were developed. Much of this type of equipment was developed in Old Ocean at this time by J. S. Abercrombie, who was at that time the owner of J. S. Abercrombie Co. The field saw its greatest development period in the years from 1937 to 1941.

Abercrombie is operator, under a unitization agreement made 2 years ago, for most of the other interests in the field. They include Stanolind Oil & Gas Co., The Texas Co., Tide Water Associated Oil Co., Fidelity Oil & Royalty Co., Magnolia Petroleum Co., Old Ocean Oil Co., Phillips Petroleum Co., LaGloria Corp., Mound Co., Trammel Trustees, R. A. Welch, R. D. McDonald, Jr., and Abercrombie.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

WEST TEXAS.—Magnolia Petroleum Co. 2 Roy Parks, 11½ miles southwest of Midland, flowed 124 bbl. of oil in 1 hour on drill-stem test of 15 ft. of Ellenburger pay, from formation top of 12,955 ft., and total depth of 12,970 ft. Packer was set at 12,944 ft. General Crude Oil Co. and Percy Jones 1-166 Young, ½ mile north extension to Salt Creek Canyon field, Kent County, had flowing production on its second drill-stem test, open 1 hour at 6,100-50 ft. It was to drill ahead to 6,490 ft. for completion. The 1-66 Young had the highest reef top yet logged in the field; Hunt 1 Mary Couts Burnett was previously the field's high well with a reef top of minus 4,023 ft.

NORTH TEXAS.—The first Caddo oil production for Baylor County was in prospect at J. J. Lynn 1 First National Bank of Fort Worth, located 10 miles southeast of Seymour and southeast of the old British-American-Turbeville Pennsylvanian lime field. A drill-stem test at 5,088-99 ft. recovered 315 ft. of free oil.

SOUTHWEST TEXAS.—J. S. & R. H. Abercrombie 1 A. E. Nelson, Juan Garcia Survey, A-129, is opening a new field in San Patricio County. Gas flowed through perforations (7,280-85 ft.) which were squeezed off and operators will test lower sands before final completion. A new pay has been opened in Portilla field, San Patricio County, at Superior Oil Co. 7 Minnie S. Welder, which flowed 261 bbl. of 40°-gravity oil per day through perforations at 7,416-21 ft.

ROCKY MOUNTAIN AREA.—Two important wildcats in the Denver-Julesburg Basin have tested water in possible producing sands: Stanolind Oil & Gas Co.'s 1 Elred in Garden County, Nebraska, and British-American Oil Producing Co.'s 1 Thomas in Logan County, Colorado. Pure Oil Co. is drilling below 15,060 ft. at its 1 Unit, deep Badwater, Wyoming, wildcat after encountering shows below 15,000 ft.

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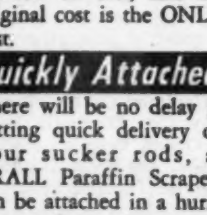

Cross section showing "U" band being die-formed around rod to the scraper blades.

Cross section showing band held under pressure around rod while ends of band are shrink-grip attached to scraper blades. Neither scrapers nor bands are welded to sucker rods.

CRALL Spiral Paraffin Scrapers fit any sucker rod for 2" or 2½" tubing. Order your CRALL Scrapered Rods from your supply store, or write, write, or phone for full descriptive literature.

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Kansas

Rooks County Stepout Finds Oil in Arbuckle

IN the area east of Plainville in Rooks County and about ½ mile west of Nettie pool, Berwick & Isern 1 Carmichael, SE SE SE 33-9s-17w, had a good Arbuckle drill-stem test. Top of the Arbuckle was called at 3,515 ft. and a 15-minute drill-stem test at 3,518-27 ft. had a recovery of 855 ft. of oil. Bottom-hole pressure was 890 psi. Casing has been set at 3,515 ft.

The Morris County pool opener, Koester & Mergen 1 Burns, SW NW SW 25-16s-5e, has been completed with a pumping potential of 40 bbl. daily with production from the Mississippian at 2,208-52 ft. The new well is about 4 miles north of Burdick pool.

The Graham County wildcat, W. L. Hartman 1 Martin & Webster, NE NE NE 9-10s-21w, south of Morel pool, has been completed with a potential of 299 bbl. daily from Lansing-Kansas City. Production is through perforations at 3,696-3,704 ft. Oil is 38° gravity.

Another Graham County wildcat has a good Lansing show. C-G Drilling Co. and D. G. Hansen 1 Sutor, SE SE SW 23-9s-22w, topped the Lansing at 3,564 ft. and a drill-stem test at 3,598-3,610 ft. had a recovery of 120 ft. of oil and 50 ft. of oil-cut mud on a 30-minute test. Operator is drilling ahead for tests of the Arbuckle. The well is about 1 mile north and ½ mile west of Fargo pool which also produces from the Lansing-Kansas City.

In the area about 1 mile northeast of East Rolling Green pool and 2 miles southeast of Sunny Valley pool in Barton County, Anschutz Drilling Co. has set pipe to test an Arbuckle show at 1 Batchman, SE SE SE 19-20s-12w. Casing was set on top of the Arbuckle at 3,464 ft.

Northern Ellis County has another prospective Lansing-Kansas City pool with indicated production at Okmar Oil Co., Pickerell Drilling Co., and Appleman 1 Gassoway, NE NE NW 11-11s-19w, a little more than 1 mile south of the county line and about 1½ miles south of Zurich pool in Rooks County. Lansing top was called at 3,332 ft. and the well is reported to have swabbed 30 bbl. of oil in 4 hours through perforations at 3,548-52 ft.

In the northern part of Stafford County about 2 miles north of North Pundsack pool and west of Rothgarn pool, Petroleum, Inc. 1-B Brown, NE NE NW 7-21s-13w, is testing the Arbuckle following a good show in the Lansing-Kansas City. A drill-stem test of the Lansing at 3,446-61 ft. with tool open for 1 hour had a recovery of 1,500 ft. of clean oil. The Arbuckle was topped at 3,622 ft.

KANSAS SUCCESSFUL WILDCATS

Marion County: Gear et al 1 Robison, EW SW NE 31-20s-5e, elev. 1,403 ft., pumped 18 bbl. of oil per day from Viola at 2,563-66 ft., TD.

Morris County: Koester 1 Burns, SW NW SW 25-16s-5e, elev. 1,464 ft., pumped 40 bbl. of oil per day from Mississippian at 2,208-52 ft., TD.

KANSAS WILDCAT FAILURES

Barton County: Powell-Peters 1 Knopp, SE SE NE¼ 16-19s-12w, elev. 1,854 ft., dry, TD 3,465 ft.

Butler County: Crest 1 Hagan, SW SW SE 22-23s-4e, elev. 1,418 ft., dry, TD 1,835 ft.

National Associated 1 Smith, SW SW NE 29-28s-6e, elev. 1,405 ft., dry, TD 3,265 ft., Arbuckle 3,175 ft.

Cowley County: Wakefield et al 1 McKay, SE SW NE 1-30s-3e, elev. 1,195 ft., dry, TD 3,214 ft., Stalnaker 1,950 ft., Kansas City 2,305 ft., Mississippi lime 2,841 ft., Arbuckle 3,193 ft.

Ellis County: Anschutz 1 Robbins, SE SE SW 4-14s-16w, elev. 1,920 ft., dry, TD 3,518 ft., anhydrite 1,030 ft., Lansing-Kansas City 3,172 ft., Sooy 3,426 ft.

Lyon County: Lance Hill et al 1 Blair, SW SW SW 8-20s-12e, elev. 1,130 ft., dry, TD 1,980 ft., Lansing 900 ft., Kansas City 1,195 ft., Mississippi lime 1,948 ft.

Osborne County: Davis 1 Applegate, NW SE SW 11-10s-12w, elev. 1,744 ft., dry, TD 3,221 ft., anhydrite 772 ft., Heebner 2,925 ft., Kansas City 2,980 ft.

Pawnee County: Schermerhorn 1 Koelsch, NE NE SW 33-22s-15w, elev. 2,005 ft., dry, TD 4,135 ft., cherty Sooy 3,893 ft., cherty Viola 3,932 ft., Simpson shale 4,037 ft., Simpson sand 4,060 ft., Arbuckle 4,118 ft.

Reno County: Pabco 1 Irsik, NW NW SW 13-26s-5w, elev. 1,441 ft., dry, TD 4,050 ft., Simpson 4,024 ft.

Russell County: Henderson 1 Foster, NW NW NW 29-13s-15w, elev. 1,926 ft., dry, TD 3,400 ft., Topeka 2,830 ft., Heebner 3,055 ft., Lansing-Kansas City 3,102 ft., Arbuckle 3,355 ft.

Coop 1 Schmidt "A," SW NW NW 29-14s-15w, elev. 1,820 ft., dry, TD 3,446 ft., Heebner 3,005 ft., Toronto 3,021 ft., Lansing-Kansas City 3,056 ft., Sooy 3,302 ft., reworked Arbuckle 3,390 ft., Arbuckle 3,396 ft.

Keystone 1 Nuss, NW NW NW 8-15s-11w, elev. 1,843 ft., dry, TD 3,386 ft., Heebner 2,903 ft., Lansing-Kansas City 3,007 ft., Sooy 3,325 ft., Arbuckle 3,356 ft.

Saline County: Williams 1 Miller, SW NE SW 35-15s-3w, elev. 1,282 ft., dry, TD 3,371 ft.

Stafford County: Isern 1 Shoop, NW SW SW 31-25s-13w, elev. 1,970 ft., dry, TD 4,442 ft., basal Kansas City 4,060 ft., Sooy 4,131 ft., Viola 4,255 ft., Simpson shale 4,344 ft., Simpson sand 4,351 ft., Arbuckle 4,414 ft.

EASTERN NEBRASKA WILDCAT FAILURE
(Previous Completion)

York County: York 1 Roehrs, SW SW NW 11-12n-2w, dry, TD 3,000 ft., Topeka (?) 1,250 ft., Lansing-Kansas City 1,450 ft., Mississippi lime 1,970 ft., Kinderhook 2,186 ft., Hunton 2,221 ft., Maquoketa 2,428 ft., Viola 2,486 ft., Simpson 2,703 ft., Arbuckle 2,786 ft., quartz 2,977 ft., granite 2,998 ft.

Mississippi

Offset in Pickens Field Drilling Below 7,473 Ft.

JACKSON.—In Pickens field, Yazoo County, Carter Oil Co. 1 R. M. Bridgeforth, SW SW 30-12n-3e, west offset to the Lower Cretaceous discovery well for the field, is drilling below 7,473 ft. Operators plan to core for sand body which was encountered at 7,510-45 ft. in the discovery well.

This sand was not tested in the discovery well and no shows were detected in sidewall cores, but had a good resistivity kick on electrical log. It is thought that the sand might carry dry gas. All sands are to be cored and tested in an effort to determine whether or not the salt water being produced in the discovery, Carter 1 Wilson, is coming from the sand or is the result of a defective cement job.

In southeastern Amite County, Humble Oil & Refining Co. is preparing to drill a 12,500-ft. or top of Lower Cretaceous test in Section 33-1n-6e. Exact location is 660 ft. north and 1,980 ft. east of southwest corner of the section on the J. Claud Wilson acreage.

In Clarke County, Alabama, Humble Oil & Refining Co. 1 Marion Davies et al, 15-3n-2e, second field opener for the state, is testing at the rate of 40 bbl. of oil per day on pump. Gravity of the oil is 14°.

In the same county, James L. Duffy will drill a wildcat test in 15-9n-1w. Test is in the area where The California Co. has drilled several dry wells.

In Stone County, Mississippi, George Vasen is coring at 17,060 ft. in his 1 fee,

9-2s-11w. This well has set a depth record for the entire Gulf Coast area.

MISSISSIPPI WILDCAT FAILURE

Noxubee County: Harvey Schmidt 1 Mrs. Lillian N. Evans et al, 1-13n-16e, dry, TD 2,505 ft.

Oklahoma

Cleveland Wildcat Gets Gas and Distillate

IN the southeastern part of Cleveland County, Benson & Montin 1 Pearch, SW SW SE 30-6n-1e, about 3½ miles east of West Corbett pool, had a large volume of gas and some distillate on a test of the Bartlesville. A drill-stem test taken at 5,786-5,805 ft. with tool open for 16 minutes had gas in 2 minutes, estimated at better than 10,000,000 cu. ft. per day. Recovery was 2 ft. of distillate. Bottom-hole pressure was 1,725 psi. Operator will take well on down for test of the Wilcox and is now drilling below 5,820 ft.

Warren Oil Corp. has staked a south offset to the Noble County well just completed between South Ceres and Northeast Longview pools. The new spot is Warren 1 Kihega, NW NW NW 6-23n-1e. The completed well is Howell and Walter Duncan 1 Jirious which made 480 bbl. daily from Burbank sand at 4,300-62 ft. through 20/64-in. tubing choke.

Amcan Oil Corp. 1 Hayes, C SW NW 27-4n-3w, Garvin County, had a good oil flow from Gibson sand and apparently is the linking well between Southeast New Hope pool and the extension area on the west side of Southwest Maysville pool. Top of the Gibson was called at 7,110 ft. and a drill-stem test at 7,113-37 ft. had gas in 3 minutes and oil in 20 minutes, flowing at the rate of 45 bbl. per hour. Well will go deeper for tests of the Hart.

In the next section to the south, Mid-Continent Petroleum Corp. 1 John Hassen, C SE NE 34-4n-3w, flowed 500 bbl. daily from Gibson sand through perforations at 6,906-24 ft. Mid-Continent 2 Hassen, C NE SE of same section, made 400 bbl. daily.

Stephens County has a possible discovery well northeast of Duncan and west of Northeast Duncan pool at Dick Wegener 1 Steelman, NW SW NE 23-1n-7w. A drill-stem test at 5,998-6,041 ft. with tool open for 1 hour had gas in 6 minutes and recovered 190 ft. of oil, 170 ft. of oil-cut mud, and 390 ft. of salt water. The lower part of the zone, 6,028-41 ft., had a recoverey of 90 ft. of oil-cut water and 375 ft. of salt water. Using two packers, the top portion was checked with a showing of gas in 4 minutes and a recovery of 175 ft. of heavily oil-cut mud.

OKLAHOMA SUCCESSFUL WILDCATS

Cleveland County: Mid-States Oil Co. 1 Trimble, SE SW NW 29-10n-2w, elev. 1,194 ft. (geological wildcat, dual completion), new zone discovery of gas from unconformity topped at 6,963 ft., flowed 174 bbl. of 42°-gravity oil from second Wilcox at 7,413-25 ft., TD 7,500 ft.

Garvin County: Helmerich & Payne 1 Tuley, SW NE NE 13-1n-1w, N Hoover area, flowed 40 bbl. of 46°-gravity oil per day from sand at 3,264-90 ft., TD 3,332 ft., elev. 983 ft.

Lincoln County: The Texas Co. 2 Watson, SE NE NW 9-12n-3e, 6½ mi. E of N McLoud, elev. 994 ft., flowed 43 bbl. of 35.4°-gravity oil per day from Red Fork at 4,694-4,709 ft., TD.

Noble County: Blair 1 Wisener, NW NW SE 12-23n-1w, 1½ mi. S discovery, elev. 956 ft., flowed 129 bbl. of 44°-gravity oil per day from Bartlesville at 4,394-4,441 ft., TD.

Pottawatomie County: Gulf Oil Co. 1 Jezek, SW SE NE 2-11n-6e, 1 mi. SW Garden Grove, est. elev. 946 ft., pumped 20 bbl. of 37.3°-gravity oil per day from Earlsboro at 3,397-3,415 ft., TD 4,432 ft.

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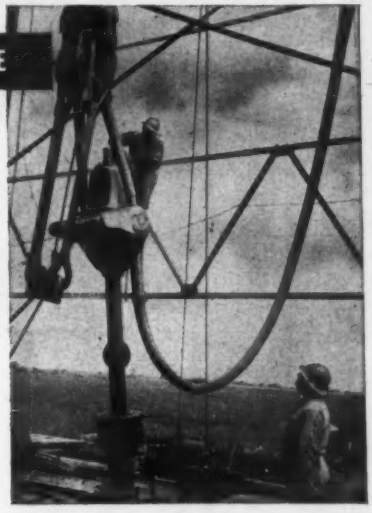

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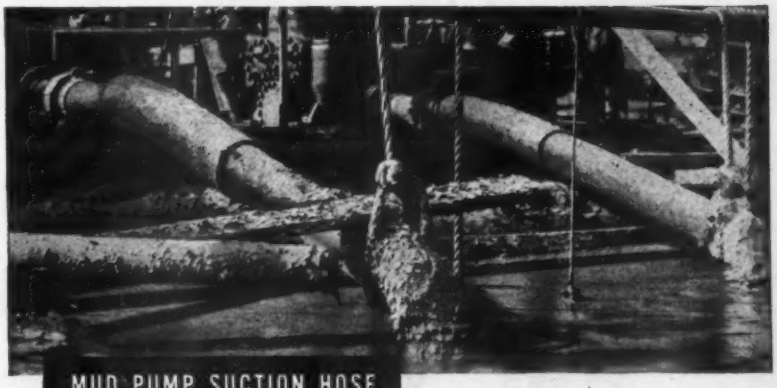

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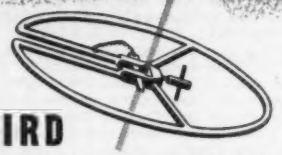

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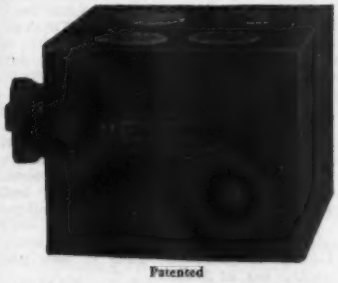

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OKLAHOMA WILDCAT FAILURES

Cleveland County: Zephyr Petroleum Co. 1 Shobert, C NE SE 7-7n-1e, 7 mi. S of SE Denver, elev. 1,224 ft., dry, TD 7,210 ft.

Hughes County: Deep Rock Oil Co. 1 Stevenson, NE SE NW 36-7n-8e, 1½ mi. SE of W Holdenville, est. elev. 830 ft., dry, TD 4,852 ft.

Johnson County: F. H. & W. O. Teakell 1 Chapman, NW NE SW 36-4s-4e, dry, TD 120 ft., Bilbo sand 117 ft.

Lincoln County: Waggoner et al 1 Kroutil, SW SW SW 27-12n-6e, ⅝ mi. SW new pool, dry, TD 3,453 ft., Hogshooter 1,890 ft., Checkerboard 2,205 ft., Oswego 3,090 ft., upper Prue 3,185 ft., no Verdigris, lower Prue 3,270 ft.

Logan County: J. Murray Henry 1 Shelton, NW NW SW 20-17n-1e, 1½ mi. SE Langston, dry, TD 5,312 ft.

Murray County: Carlock et al 1-B Littleton, NW NW SE 31-1n-3e, est. elev. 932 ft., dry, TD 584 ft., broken sand 400 ft. and 565 ft. with slight show of oil.

Pawnee County: C. C. Nye 1 Roe, NW SW SE 15-22n-7e, 1¼ mi. NE of E. Blackburn, elev. 870 ft., dry, TD 2,642 ft. in Mississippi lime.

Stephens County: C. L. McMahon 1 Roberts, SE SE SE 10-2s-7w, elev. 1,105 ft., dry, TD 4,069 ft., Loco lime 2,832 ft., Canyon 3,705 ft., basal Pennsylvanian-Simpson 4,040 ft.

Southwest Texas

New Gas Discovery Reported In San Patricio County

CORPUS CHRISTI.—J. S. Abercrombie and R. H. Abercrombie 1 A. E. Nelson reported a flow of 100 bbl. of condensate plus 3,500,000 cu. ft. of gas per day through a 15/64-in. choke, and operators will complete the well for a new gas field discovery in the Juan Garcia Survey, Abstract 129, San Patricio County. The well flowed through perforations at 7,280-85 ft., but perforations were squeezed off and operators plan to test lower sands before completing the well. It is at a total depth of 7,471 ft. and has 7-in. pipe set at 7,468 ft.

New pay has been opened in the Portilla field, San Patricio County, at Superior Oil Co. 7 Minnie S. Welder, Francisco and E. Portilla Survey, Abstract 25. The well flowed 261 bbl. of 40°-gravity oil per day through a 10/64-in. choke through perforations at 7,416-21 ft. Tubing pressure was 1,300 psi. and the gas-oil ratio 898.

Coastal Refineries, Inc., and Mayfair Minerals, Inc., 1 McAllen Country Club, Hidalgo County, is coring below 8,653 ft. in sand after testing gas and condensate at 8,568-76 ft. On 13-minute drill-stem test at that depth, the well recovered 90 ft. of condensate and 120 ft. of muddy water, through ¼-in. chokes. Bottom-hole flowing pressure was 4,700 psi. and shut-in pressure of 5,500 psi. Two more drill-stem tests were run below this depth, down to 8,617 ft., with similar results. The potential field opener is located in Block 6, Hidalgo Canal Co. Subdivision.

Two shallow wildcats in Bexar County have come in for small producers on pump, opening new oil-producing areas. Fifteen miles east-northeast of San Antonio, N. B. Duke 1 A. Pinaniezk recorded a potential of 8 bbl. of 36°-gravity oil daily on pump from open hole at 1,514-30 ft. Six miles south of San Antonio, in Fernando Rodriquez Survey 6, M. L. Wise et al tested 41½ bbl. of oil daily in their 1 W. Friesenhahn from total depth of 1,208 ft.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) SUCCESSFUL WILDCATS

Bexar County: Oil discovery—N. B. Duke 1 A. Pinaniezk, J. W. Rials Sur. 11, 15 mi. E of San Antonio, top pay 1,514 ft., TD 1,530 ft., open hole 1,514-30 ft., IP: 8 bbl. oil per day on pump, 36° gravity.

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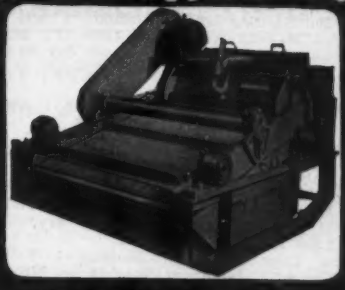

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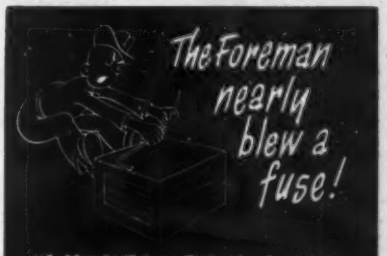

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XUM

San Patricio County: New pay at West Sinton—Grace Oil Co. 6 Edward Trigg, Block 23, John Pollan League, top pay 2,189½ ft., TD 2,800 ft., IP: 125 bbl. oil per day, perf. 2,189½-95 ft., 11/64-in. choke, 21° gravity, TP 260 psi., CP 110 psi.

Willacy County: Oil discovery—G. L. Reason 1 Dale Johnston et al, Lot 11, Blk. 29, Harding-Lindeahl Subd., 4 mi. W of Raymondville, TD 7,010 ft., perf. 7,010-20 ft., IP: 49 bbl. oil per day, ¾-in. choke, TP 25-30 psi., CP 625 psi., 39.6° gravity.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) WILDCAT FAILURES

Atascosa County: LaParita Oil Co. 1 G. F. Campbell, Tract 65, Natascosa Colony Subd., dry, TD 1,514 ft.

Bexar County: A. Edmiston, Trustee, 1 H. A. Nohse, Juan Montes Sur., A-11, 11 mi. SE of San Antonio, dry, TD 2,358 ft.

Duval County: Gorman-Delange 1 Yates Ranch, J. Poitevent Sur., 13 mi. NE of Freer, dry, TD 3,558 ft.

Jake L. Hamon & Edwin L. Cox 1 Matiana B. Gonzales et al, AB&M Sur. 371, 7 mi. NW of Benavides field, dry, TD 3,812 ft.

Kenedy County: Humble Oil & Refining Co. C-3 John G. Kenedy, Jr., Las Borrosas Gr., 10 mi. S of Sarita, dry, TD 9,899 ft.

Nueces County: H. H. McFarland 1 L. P. Cook, Sec. 5, Laureles Farm Tracts, 7 mi. S of Corpus Christi, dry, TD 8,189 ft.

Starr County: Continental Oil Co. 1 John G. Champion, Porc. 99, A-270, 2 mi. N of Yturria field, dry, TD 6,198 ft.

Webb County: O. W. Killam 1 Floyd Billings, Sur., 40, 16 mi. N of Bruni, dry, TD 2,978 ft.

McCarrick Oil Co. 1 Albert Martin, Trustee, BS&F Sur. 693, 5 mi. N of Bruni, dry, TD 2,744 ft.

Williamson County: W. M. Jarrell 1 C. N. Avery et al, E. Ryan Sur., 2 mi. E of Hutto, dry, TD 2,952 ft.

Permian Basin

Midland Ellenburger Test Shows for Prolific Pay

MIDLAND.—Magnolia Petroleum Co. 2 Roy Parks, Pennsylvanian and Ellenburger discovery, 11½ miles southwest of Midland and 13 miles north of Pegasus field, prepared to run 5½-in. casing to 12,944 ft. for completion tests in the Ellenburger. Top on the Ellenburger was 12,955 ft., or minus 10,120 ft. Total depth was 12,970 ft., in Ellenburger dolomite. The Ellenburger top in the Parks test was correlated about 108 ft. high to The Texas Co. 1 Sharbauer, small and only producer in Warfield pool, about 4 miles to the northwest.

Before setting casing, operators ran a drill-stem test from 12,944-70 ft., using ⅝ and 1-in. chokes. Gas showed in 7 minutes, mud in 19 minutes, and oil in 22 minutes which was allowed to flow to pits for 2 minutes. The well then flowed 134 bbl. of 53.9°-gravity oil in 1 hour, with gas-oil ratio of 1,042 cu. ft. Bottom-hole flowing pressure ranged from 4,700-4,170 psi., and shut-in pressure was 5,565 psi. in 15 minutes. The testing tool was open 1 hour and 24 minutes. Recovery in the pipe was reversed out. Operators said there was no formation water along with the oil. The well had previously shown for commercial production in the Pennsylvanian at 10,398-10,468 ft. (For additional details, see the news section of this issue).

In northwest Mitchell County, J. W. Murchison 1 J. C. Womack, SE NW 8-26-H&TC, appeared to be a commercial well in the Canyon reef, after finding the Ellenburger dry. Field reports indicated Shell Oil Co. to be lending support for additional testing, at a time when the well had all the appearances of a dry hole. The 1 Womack was drilled to total depth of 8,126 ft., just short of the Ellenburger. With Shell participating, it was said, the hole was carried on down to 8,338 ft. in dry Ellenburger limestone, topped at 8,270 ft., on elevation of 2,272 ft. It was then plugged back to 7,800 ft. and a 90-minute drill-stem test made from 7,685-7,800 ft., using 750 ft. of water blanket. It flowed the water blanket to the surface in 30 minutes, mud 10 minutes later, followed by a spray of oil and gas in 52 minutes. Gas volume was estimated at 5,000,000 cu. ft. daily. The oil flow was estimated at 5-10 bbl. an hour. Recovery was 180 ft. of oil and 270 ft. of salty oil and gas-cut mud, plus additional oil and gas which unloaded when there was still 1,900 ft. of drill pipe in the hole. Bottom-hole flowing pressure was 2,050 psi., and 15-minute shut-in pressure was 2,750 psi.

Location of the Womack test is about 2½ miles south of Standard Oil Co. of Texas 1 B. F. Dunn, a 1949 Canyon reef discovery in NW SW 64-20-LaVaca Navigation Co. Survey, which completed natural for 499 bbl. of oil a day through ½-in. choke, from Canyon pay at 7,550-83 ft. The Murchison well had top of reef at 7,693 ft., said to be 311 ft. low to the Dunn field discovery, and had top of the Strawn at 7,980 ft.

Two miles south of Salt Creek field of Kent County, (Hunt-Young), Estill S. Heyser, Jr. 2 L. T. Lohman, 114-G-W&NW, was shut in for storage after flowing 192.2 bbl. of oil in 6 hours through open 2-in. tubing. The well had been shut in 18 hours and when opened had 300 psi. pressure on casing and 625 psi. on tubing. It flowed 40 bbl. of oil the first hour, and the next five hourly gages were: 38, 32, 25.6, 27.8 and 28.8 bbl. of oil. Acid treatment had been corrected to 500 gal. of mud acid and 3,500 gal. of regular acid, in open hole from 6,520-34 ft., followed with a second 500 gal. of mud acid and 6,000 gal. of regular acid through 176 casing perforations from 6,472-6,516 ft.

On the north side of the same field, General Crude Oil Co. 1-166 Young, located 660 ft. from west and 760 ft. from south lines of northeast quarter of 166-97-H&TC, or 2,860 ft. north and slightly west of the field discovery, was running 159 ft. higher than the discovery, based on first reports of the Pennsylvanian reef top at 6,062 ft., or minus 3,960 ft. The Caroline Hunt 1 Young had top of the reef at minues 4,119 ft. General Crude's test ran a 1-hour drill-stem test from 6,060-6,100 ft., which produced a light blow of gas at the surface in 30 minutes and recovered 675 ft. of heavily oil and gas-cut drilling mud. According to reports, a part of that fluid was clean oil, with no water. It was drilled ahead, and reported a drilling break in lime at 6,137 ft. At last report operators were preparing to run a test from 6,100-50 ft.

Southern Minerals Co. 1 G. F. Allen, Morris sand discovery (upper Strawn), 4 miles west of Ballinger in Runnels County, swabbed at the rate of 105 bbl. of clean oil a day from casing perforations between 3,722-32 ft. The well missed the pay in the Canyon that was discovered by Kingford Oil Co. 1 Barnett, one location to the south. Southern Minerals 1 Allen is 1,650 ft. from northwest, and 330 ft. from the most northerly southeast lines of the Sama Christa Survey 432.

WEST TEXAS (DISTRICTS 8 AND 7-C) WILDCAT FAILURES

Crockett County: Oliver & Kotyza 1 University, SW SW SW 22-45-University Lands Sur., 3 mi. E Midway Lane field, dry, TD 1,650 ft., elev. 2,634 ft., anhydrite 925 ft., lime 1,300 ft.

Pecos County: George Grigson 1 Edith Trees, 48-8-H&GN, 6 mi. SW Grandfalls, dry, TD 3,037 ft., elev. 2,532 ft., Rustler anhydrite 1,662 ft., Rustler dolomite 1,772 ft.

TEXAS PANHANDLE (DISTRICT 10) WILDCAT FAILURE

Hansford County: Phillips Petroleum Co. 1 Keffer, 2,362 ft. from N, 2,379 ft. from W lines, 135-2-GH&H, dry, TD 7,148 ft. in Mississippian, elev. 3,160 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Honolulu Oil Corp. 3-X State, NE SE 13-11s-27e, confirmation well and east offset to the Devonian discovery well of the Chisholm field, Chaves County, rated 1,763 bbl. of 41.6°-gravity oil a day, based on a 12-hour completion test. Production was through open 2-in. tubing, under flowing pressure of 350 psi., from open hole between 5½-in. casing set at 6,591 ft., and 6,556 ft., total depth. The section had been washed with 500 gal. of mud acid, then treated with 2,000 and 8,000 gal. of regular acid. The second well ran about flat with the discovery, which completed for 170 bbl. of oil a day through 11/32-in. choke, from pay at 6,490-6,563 ft. Location of the new field is 18 miles southeast of Roswell.

Union Oil Co. of California 1 Compton State, 24-14s-31e, Chaves County, was drilling in lime and chert below 10,094 ft.

In Lea County, Gulf Oil Corp. 1 Sims-State, 17-15s-33e, was below 10,352 ft. in lime and shale. A drill-stem test from 10,157-179 ft., open 1 hour, recovered 2,200 ft. of water blanket and 390 ft. of salt and sulfur water. Bottom-hole flowing pressure was 1,025-1,150 psi.

SOUTHEAST NEW MEXICO SUCCESSFUL WILDCAT

Eddy County: Franklin, Aston & Fair 2 Nelson, SW SW NW 4-18s-30e, 1½ mi. E Loco Hills field, TD 3,519 ft., elev. 3,561 ft., San Andres 3,268 ft., pay 3,509 ft., pumped 50 bbl. of 36°-gravity oil, 5 bbl. water in 24 hr.

South Louisiana

Gas Distillate Producer Is Completed in LaFourche

NEW ORLEANS.—Humble Oil & Refining Co. has completed 1 Lake Raccourci State Lease 1,451 for a gas-distillate producer in wildcat territory in the Lake Raccourci area of LaFourche Parish. The well was drilled to 13,000 ft. and plugged back to 9,200 ft. for completion attempt. Through a ⅛-in. choke, the well flowed 53 bbl. of distillate plus 724,630 cu. ft. of gas per day from just above the plugback depth. Tubing pressure was 3,200 psi.

Oil production has been confined in the new Phoenix Lake field of Calcasieu Parish at Ohio Oil Co. 2 E. W. Brown, Jr., west offset to the discovery well. On drill-stem test at 7,743-82 ft. in the discovery zone, the well flowed 40°-gravity oil, and test at 7,944-65 ft. showed flow of gas-condensate. Operators will complete the well through perforations at the 7,743-82-ft. level. The well is bottomed at 8,060 ft. and has 7-in. casing set at 8,055 ft.

Southern Six Drilling Co. 1 Martin Pusson, southeast outpost test at Iota field, Acadia Parish, is being completed for a gas-condensate producer below 9,500 ft. in a new pay zone. The well came in through perforations at 9,554½-74½ ft., and was cleaning gas and condensate through an 11/64-in. choke. Tubing pressure was 3,300 psi. and shut-in pressure was 3,600 psi. This well was drilled to a depth of 9,589 ft. at which depth it blew out. Operators brought it under control, and sidetracked at 4,900 ft. to go around the stuck drill pipe. The new hole was drilled to 9,500 ft. and a string of 7-in. casing was set to that depth for protection before coring the new pay zone.

Magnolia Petroleum Co. 1 Alice B. Rozas, deep wildcat in St. Landry Parish, is testing further up the hole after running several drill-stem tests below 12,000 ft. On drill-stem test at 12,585-601 ft., test tool was open 1 hour, but recovery was only 620 ft. of mud. Previous tests at 12,985-13,003 ft. and at 12,890-920 ft. yielded similar results. The well is bottomed at 14,000 ft.

SOUTH LOUISIANA WILDCAT FAILURES

Beauregard Parish: Sun Oil Co. 1 Long

Bell, 21-5s-9w, 3 mi. W-NW of Longville townsite, dry, TD 9,004 ft.

Terrebonne Parish: Magnolia Petroleum Co. 1-A State Lease 775, Ship Shoal Block 108, offshore, dry, TD 14,050 ft.

Texas Gulf Coast

Gas, Distillate Production Assured in Galveston Bay

HOUSTON.—Gas and distillate production has been established in Galveston Bay 5 miles southwest of Anahuac, Chambers County, at Humble Oil & Refining Co. E-1 Galveston Bay State. The well flowed 1,634,000 cu. ft. of gas plus 12 bbl. of 55.6°-gravity distillate through a 3/16-in. choke. Production is through perforations at 8,790-800 ft.

G. S. Hammonds is completing 1 Walter Schneider, James Cummings Survey, Abstract 31, Austin County wildcat, for a new dual discovery in the Gulf Coast. On a 9½-hour production test through perforations at 10,057-72 ft., with packer set at 10,018 ft. and 984 ft. of water cushion, ½-in. bottom and ¼-in. top chokes, the well unloaded water cushion in 1½ hours and started flowing an estimated 2 bbl. of 43.8°-gravity oil per hour. Maximum working pressure was 320 psi. On a later 20-hour test, the well flowed 99 bbl. of oil daily. Operator is preparing to dually complete the well and will perforate lower sands at 10,588-93 ft.

Dr. S. H. Bergman et al 3 Ernest Coker indicates a new discovery in the John T. Pickney Survey, Abstract 63, 2½ miles north of Goodrich in Polk County. The well is flowing an estimated 5 bbl. of oil per hour, being about 40 per cent salt water, through perforations at 2,843-48 ft. The well was flowing through a 7/64-in. choke, and flowing pressure was recorded at 870 psi.

In the Wolf Point area of Calhoun County, Humble Oil & Refining Co. 2 Maude B. Traylor is at a total depth of 9,841 ft. and operators are testing for completion. On 4-hour drill-stem test at 9,811-22 ft., using ⅜-in. choke, the well recovered 900 ft. of 48.5°-gravity condensate and 900 ft. of gas-cut mud. Perforations were squeezed off and operators reperforated at 5,978-94 ft. On a 5½-hour test, using ⅜-in. choke, recovery was 2,450 ft. of muddy gas-cut fresh water and 1,000 ft. of water cushion. Another test at 9,055-72 ft. recovered only mud and salt water. This wildcat is located 2 miles west-southwest of Olivia in the Juan Maldanado Grant.

TEXAS GULF COAST (DISTRICTS 2 AND 3) SUCCESSFUL WILDCATS

Bee County: Gas discovery—Curtis Singleton Drilling Co. 1 W. C. McCord, P. Wilcox Sur., A-491, 6½ mi. W of Beeville, TD 1,976 ft., perf. 1,961-71 ft., IP: 3,800,000 cu. ft. of gas, open flow.

Chambers County: Gas-condensate discovery—Humble Oil & Refining Co. E-1 Galveston Bay State, Tract 17-B Galveston Bay, 5 mi. SW of Anahuac, TD 9,291 ft., top pay 8,790 ft., perf. 8,790-800 ft., IP: 12 bbl. condensate and 1,634,000 cu. ft. of gas, 3/16-in. choke, TP 3,000 psi., 55.6° gravity.

Goliad County: Oil discovery—Magnolia Petroleum Co. 1 C. C. Diebel, Sampson McTornall Gr., A-195, 2½ mi. W of Berclair, TD 3,215 ft., top pay 2,537 ft., per. 2,537-32 ft., IP: 5 bbl. oil per day on pump, 24.5° gravity.

Hardin County: New oil pool—General Crude Oil Co. et al 2 Kirby Lumber Co., H. G. King Sur., A-818, 2 mi. SW of Kountze townsite, TD 8,522 ft., top pay 8,270 ft., perf. 8,270-76 ft., IP: 217 bbl. oil per day, ¼-in. choke, TP 275 psi., 36.6° gravity.

TEXAS GULF COAST (DISTRICTS 2 AND 3) WILDCAT FAILURES

Brazoria County: Prince Drilling Co., Inc. 1 J. M. Skrabanek, Day Land & Cattle Co. Sur. A-604, 1½ mi. NW of Danbury Dome, dry, TD 10,006 ft.

Chambers County: Sun Oil Co. 1 J. M. Frost Estate, Cora Behrends Sur., A-603, 3½ mi. SW of Stowell, dry, TD 9,000 ft.

Colorado County: J. A. Gray et al 1 B. L. Vineyard, GH&H RR Sur. 31, A-253, 6 mi. NE of Eagle Lake, dry, TD 10,503 ft.

Harris County: Patrick A. Doheny 1 William P. Tautenhahn, Benjamin Barrow Sur., 2½ mi. NE of Bammel field, dry, TD 7,625 ft.

Humble Oil & Refining Co. 1 S. A. Giraud, William Scott Upper League, 3½ mi. NW of Baytown, dry, TD 7,625 ft.

R. A. Irwin & J. R. Buck 1 H. W. Gillette et al, W. M. Jones Sur., A-482, 2 mi. W of LaPorte, dry, TD 8,449 ft.

Robert S. Lytle et al 2 Knox B. Howe, J. Hamilton Sur. 879, 10 mi. S of Houston, dry, TD 7,910 ft.

Polk County: Wesley West and J. M. West 1-A West Securities Co. & Texas Long Leaf Lumber Co., A. Viesca 7-League, dry, TD 4,044 ft.

Victoria County: John B. Coffee 1 William Dietzel, R. Manchola Sur., ½ mi. W of Pridham Lake field, dry, TD 4,812 ft.

Appalachian Field

Dry Fork District Well Tops Oriskany at 8,413 Ft.

PITTSBURGH.—In the Dry Fork district of Tucker County, West Virginia, Cumberland & Allegheny Gas Co.'s important deep test, 1-A-425 Jason Harman, with elevation of 3,304 ft., logged the Oriskany sand at 8,413 ft. Total depth is 8,491 ft. with no show of gas at this depth.

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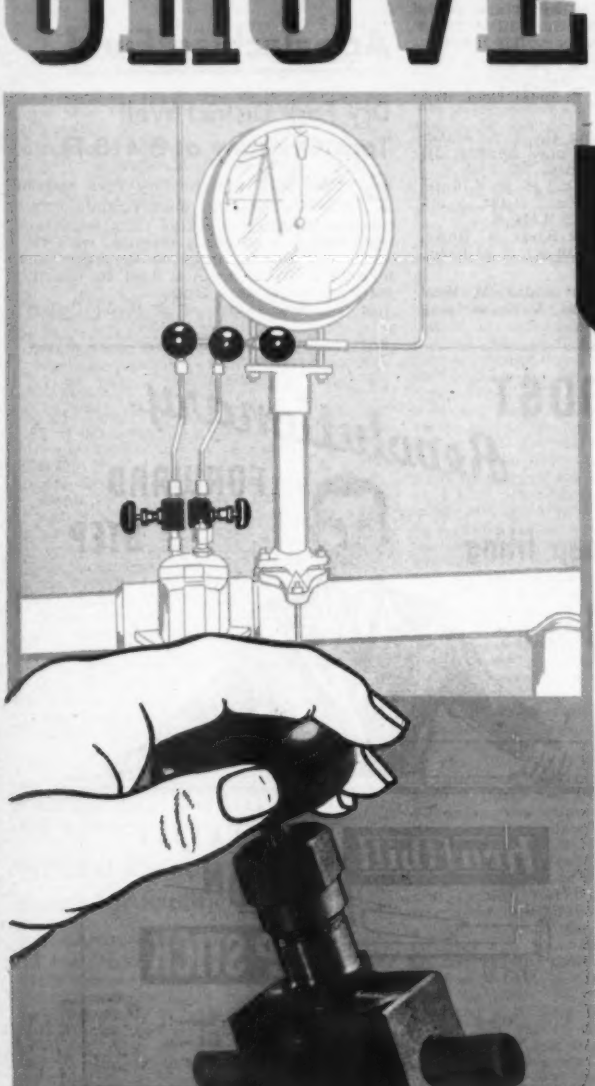

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Columbian Carbon Co. has made location for 1-GW-1149 S. M. Wigal et al. It is on the Belleville Quadrangle 1½ miles south of Latitude 39°, 05 minutes, and 2.35 miles west of Longitude 81°, 30 minutes.

In the Tucker district of Wirt County, Clarence W. Meadows, Agent, 1-L-471 Morris-Fenton W. Betts, elevation 900 ft., resulted in a dry hole, Corniferous lime was topped at 5,118 ft., Oriskany sand at 5,246 ft., water at 5,257 ft., with total depth of 5,257 ft. This well will be plugged and abandoned. In this same district, Louis E. Reed has made location for an Oriskany test, 1 Earl Tanner, elevation 1,050 ft. It is located on the Elizabeth Quadrangle 5¾ miles south of Latitude 39°, 10 minutes and 1½ miles west of Longitude 81°, 25 minutes.

In the Burning Springs district, Richter Oil Co. brought in a good shallow-sand gas well, 8 B. S. Raybuck, gaging 1,000,000 cu. ft. of gas in the Big Injun sand. Total depth is 2,160 ft.

In Allegheny Township, Westmoreland County, Pennsylvania, Apollo Gas Co. 1-877 Hugh A. M. & Mae McElroy had an initial open-flow test of 3,800,000 cu. ft. of gas, Total depth is 1,340 ft. In Unity Township, Peoples Natural Gas Co. 1-3921 Fred Musnug, elevation 2,100 ft., is drilling at 2,080 ft. In Georges Township, Fayette County, Orville Eberly et al 1 N. E. Murphy, elevation 2,560 ft., is drilling at 7,767 ft.

In Garrett County, Maryland, 5½-in. casing run by Fox & Trimble in 1 Edward Kite at 4,730 ft. did not shut off the water encountered at a depth of 4,708 ft. in chert. The well was drilled to a depth of 4,752 ft. and the casing will be rerun.

WEST VIRGINIA WILDCAT FAILURE

Wirt County, Tucker district: Clarence W. Meadows, Agent, 1-L-471 Morris-Fenton W. Betts, elevation 900 ft., dry, Corniferous lime 5,118 ft., Oriskany sand 5,246 ft., water 5,257 ft., TD 5,257 ft. P. & A.

California

Discovery Made East of Ventura Avenue Field

LOS ANGELES.—Lloyd Corp. has made an outpost discovery about 1 mile east of production in the Ventura Avenue field in Ventura County. The 1 Sexton, in 19-3n-22w, started flowing at an estimated rate of 600 bbl. a day of 32°-gravity oil and 200 bbl. of water. Point of water entry has been located and the well should be recompleted in a few days. Total depth is 13,450 ft. Significance of the discovery cannot be determined without further drilling. The well is located along the strike of the anticline and is assured for the time being to be an extension of Ventura Avenue production rather than a new pool discovery.

An outpost discovery has also been made in the 29-year-old Long Beach field in Los Angeles County where R. W. Jerman and F. R. Bartee have made an impressive discovery on the southeast flank of the field in a residential area ¼ mile from present production. Their 1 Webb, located near the intersection of Fifteenth Street and Termino Avenue, has been completed from a plugged depth of 7,440 ft. flowing at the rate of 900 bbl. a day of 28.6°-gravity clean oil and 1,500 M.c.f. of gas through a 40/64-in. choke, with 650 psi. on the casing and 350 psi. on the tubing. The operators have a 40-acre community lease and have moved out about 100 ft. for their second well. This is the second discovery in this old field in the last month.

Four California companies are about to complete a unit agreement for the exploration and development of about 11,600 acres in the Pine Mountain area of Ventura County. Companies are Standard Oil Co. of California, Richfield Oil Corp., Barnsdall Oil Co., and Honolulu Oil Corp. The lands constituting the unit area include either

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all or portions of the following sections: 31 to 34-7n-23w; 35-7n-24w; 1 to 6 and 8 to 15-6n-23w; and 6 to 9 and 14 to 18-6n-22w. The northwest part of this area falls 25 miles southeast of South Cuyama production.

Another attempt will be made to find production on the Los Angeles County prison farm near Castaic. The Texas Co. has staked location for 1 Honor Farm in 6-4n-16w. This falls between Barnsdall Oil Co. A 17-1 Honor Rancho, abandoned in 1941 at 4,717 ft., and British-American Oil Producing Co. 1 Wayside Honor Farm, drilled to 7,532 ft. and abandoned last year. Barnsdall's test had slight oil shows and produced considerable evidence of faulting.

NEVADA

E. T. Willard and Milton Kane of San Francisco plan a 6,000-ft. test on the Arden Dome structure in 31-21s-59e. About 7,000 acres are under lease in the area which lies 10 miles southwest of Las Vegas.

Continental Oil Co. and Standard Oil Co. of California's wildcat, the 1 Meridan Unit in 31-16n-58e, White Pine County, is drilling below 1,470 ft.

CALIFORNIA WILDCAT FAILURES

Kern County, Los Lobos area: Apex Petroleum Corp., Ltd., 6 Los Lobos, 8-10n-22w, dry, TD 650 ft., elev. 780 ft.

Cymric area: Los Nietos Co., 77X-7 Richardson, 7-29s-21e, dry, Carneros 7,909 ft., Phacoides 9,303 ft., Oceanic 9,960 ft., Kreyenhagen 10,080 ft., TD 10,129 ft., elev. 1,060 ft.

Stanislaus County, Patterson area: Los Nietos Co., 28-1 Covell, 1-6s-7e, dry, TD 5,427 ft., elev. 214 ft.

Fresno County, Coalinga area: Superior Oil Co., 38-34 Crowell, 34-20s-15e, dry, TD 8,436 ft., elev. 658 fe.

Colusa County, Arbuckle area: Standard Oil Co., 2-2 Arbuckle Community, 12-13n-2w, dry, TD 3,190 ft., elev. 132 ft.

CALIFORNIA SUCCESSFUL WILDCATS

Kern County, Antelope Hills area: Shell Oil Co.'s 63X-23 fee, 23-27s-19e, 3½ mi. NW of Antelope Hills field, elev. 783 ft., flowed 500 bbl. 15.3°-gravity oil a day, clean, choke and pressures withheld, TD 3,252 ft.

Louisiana-Arkansas

Oil From Davis Reported In South Sarepta Field

SHREVEPORT.—First Davis sand production in the South Sarepta field of Bossier Parish was reported at Barnsdall Oil Co. 1-A S. H. Bolinger, 210 ft. south and east of the center, 21-22n-11w, which was a dual completion from both the Davis and Ardis zones.

The well was drilled to 9,221 ft., and perforated from 9,000-20 ft., in the Davis sand, where it flowed 148 bbl. of 58°-gravity distillate a day on completion test, plus 4,800,000 cu. ft. of gas daily. It was gaged through ¼-in. choke. Casing pressure was 3,490 psi.

From perforations in the Ardis sand at 9,158-9,208 ft., it flowed 276 bbl. of distillate through ¼-in. choke, under tubing pressure of 1,589 psi., and gas-oil ratio of 5,020 cu. ft.

In Claiborne Parish, Continental Oil Co. 1 Wideman, 21-21n-7w, was drilling below 3,108 ft. Stanolind Oil & Gas Co. 1 G. W. Meadors, 8-22n-5w, was below 5,625 ft. Thirteen side-wall cores from 4,111-5,230 ft. had no shows.

John E. Yerger 1 Crow, 15-11n-10w, De-Soto Parish, was drilling below 1,506 ft. It had top of the Nacatoch at 1,100 ft.

Petersen Drilling Co. 1 Senseman, 20-14n-7e, Franklin Parish, was below 3,150 ft. Southwest Gas Production Co. 1 Colvin, 5-19n-2w, Lincoln Parish, was drilling at 4,710 ft. T. L. James & Co. 1 Burden, 36-23n-2w, Union Parish, was drilling below 6,571 ft., and according to field reports, was to be taken to the Smackover.

NORTH LOUISIANA WILDCAT FAILURE

Bienville Parish: E. C. Cook 1 A. H. Burkett, SW SW SW 9-15n-10w, dry, TD 3,015 ft., elev. 172 ft., Midway 396 ft., Nacatoch 1,029 ft., Saratoga 1,291 ft., annona 1,531-1,640 ft., Blossom 2,083 ft., Austin chalk 2,510-2,659 ft., Tuscaloosa 2,698 ft., lower Cretaceous 2,750 ft., Glen Rose 2,866 ft.

ARKANSAS WILDCAT FAILURES

Jackson County: G. M. LeGrand 1 Jacobs, SW SW SE 34-9n-1w, dry, TD 1,970 ft.

Miller County: Tex Harvey Oil Co. 1 J. W. Coker, NE SW 3-18s-27w, dry, TD 5,900 ft., elev. 269 ft., Nacatoch 1,945 ft., base Annona 2,870 ft., Tokio 3,370 ft., Massive anhydrite 5,697-5,897 ft.

Ouachita County: Garland Anthony 1 Graves, SE SE NW 8-14s-18w, dry, TD 2,875 ft., perf. 1,822-42 ft., bailed salt water.

Union County: Marine Oil Co. 1 J. Amason, SE NW SW 26-17s-13w, dry, TD 4,104 ft., elev. 141 ft., Nacatoch 2,065 ft., base Annona 2,373 ft., Graves 2,680 ft., Tuscaloosa 2,855 ft., Travis Peak 2,930 ft., Cotton Valley 4,046 ft.

McAlester Fuel Co. 1-A J. F. Nash, SW SW 12-17s-17w, dry, TD 4,011 ft., elev. 266 ft., Nacatoch 2,029 ft., base Saratoga 2,346 ft., base Annona 2,500 ft., Tokio 2,895 ft., James 3,225-52 ft., Sligo 3,436 ft., Travis Peak 3,531 ft.

Michigan

Mercer Testing Dundee at Ionia County Prospect

MOUNT PLEASANT.—Mercer Oil Co., Inc., was testing a Dundee dolomite oil pay after acid treatment with 500 gal. at company's 1 Schafer, SE SE SW 18-8n-5w, North Plains Township wildcat in Ionia County.

Dundee top was logged at 2,970 ft. and hole was bottomed out at 2,993 ft., where a small water show was reported. Hole was plugged back to 2,991 ft. to shut off this water and hole carried 350 ft. of free oil from dolomite pay logged at 2,982-88 ft.

Preliminary reports after treatment indicated the well had not responded as well as had been hoped for by acidizing. However, pump tests, with well starting to produce net oil, were being continued late this week. The wildcat is located about 3 miles south of the Bloomer Traverse oil pool in Montcalm and Ionia counties.

Mercer controls the bulk of the close-in acreage to this potential discovery with other acreage being held by Roosevelt Oil & Refining Corp. Geologically the 1 Shafer was structurally higher than any control points in the area and it appeared likely that further exploration would follow in the district regardless of the outcome of this well.

Pumping unit has been installed at McClanahan Oil Co. & W. S. Temples' 1 Post, SW SW NE 35-9n-11w, Algoma Township wildcat in Kent County, but good information regarding the well's potential after acid was still not available. The well produced at least 400 bbl. of net oil the first 7 days after acid treatment with 1,000 gal. A water-cut was showing.

This wildcat, located ½ mile west of the Rockford Traverse pool, is also producing from the Traverse at 2,342 ft., total depth. Hole filled 1,500 ft. with free oil natural in 14 hours before treatment.

Same operators were prepared to drill the diagonal southeast offset to the 1 Post, the NE NW NW SE 35-9n-11w, this week.

MICHIGAN WILDCAT FAILURES

Bay County, Gibson Township: J. O. Mutch & Ervin Major 1 Schwab, NW SW SW 12-18n-3e, Dundee 2,836 ft., dry, TD 3,010 ft.

Huron County, Brookfield Township: Alvin

H. Weber 1 Brown, NW NW NW 20-15n-10e, Dundee 2,706 ft., dry, TD 2,942 ft.

Mason County, Eden Township: Miller-Goff, Inc. Pleiness, N½ S½ NW 21-17n-16w, Dundee 2,306 ft., dry, TD 2,546 ft.

Montcalm County, Bloomer Township: Thomas Mask & Merrill Drilling Co. 1 Ward, SW SE SE 17-9n-5w, Dundee 3,077 ft., dry, TD 3,153 ft.

Van Buren County, Columbia Township: N. E. Lanning & Walhalla Oil Co. 1 Nelson, SE SE NW 4-1s-15w, Traverse 1,165 ft., dry, TD 1,193 ft.

Eastern Texas

Deep Development Started In North Lansing Field

DALLAS.—Two new operations and one completion were reported for North Lansing field of Harrison County this week. Warren Oil Corp. had derrick up at its 1 Bussey Unit, an 8,000-ft. test located 1,320 ft. west of east line and 1,320 ft. south of the north line, in the E. A. Merchant Survey. Location is a northwest outpost to Atlantic Refining Co.'s discovery, the 1 M. P. Isom. Northeast of the discovery, Atlantic had built roads, cleared location and was ready to rig up at its 1 J. O. Williams, located on a 148-acre tract. Proposed depth was 8,000 ft.

The field's completion was Atlantic 1 R. H. Still, J. Jackson Survey, and southwest of the 1 Isom. Potential was around 200 bbl. of distillate, with 23,000,000 cu. ft. of gas a day, open flow, from the Young zone of the Rodessa through perforations at 6,800-36 ft. The 1 Still had salt water with some gas in the Travis Peak.

A 7,500-ft. wildcat in the Tatum area of Rusk County was under way this week as McAlester Fuel Co. 1-A Bennetta Purse, located 4,135 ft. from west and 1,320 ft. from south lines of the Dan Martin Survey, A-526, just west of the Panola County line in the northwest corner of the county. Location is 9,300 ft. northwest of Leonard Culbertson 1 W. H. Carter, a dry wildcat at 6,908 ft.

The Texas Co. 1 Clarke, William Howeth Survey, 2 miles southwest of Pine Hill, Rusk County, was coring below 7,378 ft. Top on the Travis Peak, if it had been reached, had not been reported. The Texas Co. 1 Fannie Sorrells, 1 mile southwest of Mt. Enterprise, in the Thomas Williams Survey, was drilling below 6,363 ft.

In Navarro County, R. J. Caraway 1 W. F. Eckhardt, W. H. Smith Survey, A-725, 3 miles northeast of Wortham, was drilling below 3,500 ft. Top on the Woodbine was reported at 2,921 ft., said to be about normal for the area. Objectives are the Rodessa and Pettit zones, which have not been explored in the area.

EAST TEXAS (DISTRICTS 5, 6 AND 6-P) WILDCAT FAILURES

Denton County: J. W. Hickey & Sons 1 B. R. Bentley, J. A. Burns Sur., A-131, 2 mi. N Bolivar, dry, TD 1,867 ft., elev. 674 ft.

O. W. Killam 1 Bill Bentley, A. H. Lynde Sur., A-731, 2½ mi. NE Bolivar, dry, TD 1,736 ft. in lime.

C. H. Maxwell 1 W. D. Sherrill, H. Irwin Sur., A-650, 8 mi. SW Era, dry, TD 1,764 ft., DST 1,678-88 ft. had gas-cut mud, DST 1,758-64 ft., recovered 70 ft. of free oil, 150 ft. salt water.

Grayson County: C. Deely 1 Jesse R. Cook, R. J. Ayers Sur., A-48, 6 mi N Sherman, dry, TD 5,028 ft., elev. 752 ft.

Lamar County: Stratton, Delcambre & Smith 1 Jacob McDonald, 12 mi. N Paris, J. C. Lamb Sur., dry, TD 1,880 ft., elev. 492 ft. Goodland lime 916 ft., Paluxy 946 ft., lower Trinity 1,832 ft., by samples, had oil show around 1,850 ft.

Navarro County: S. A. Norman 1 Jim Deim,

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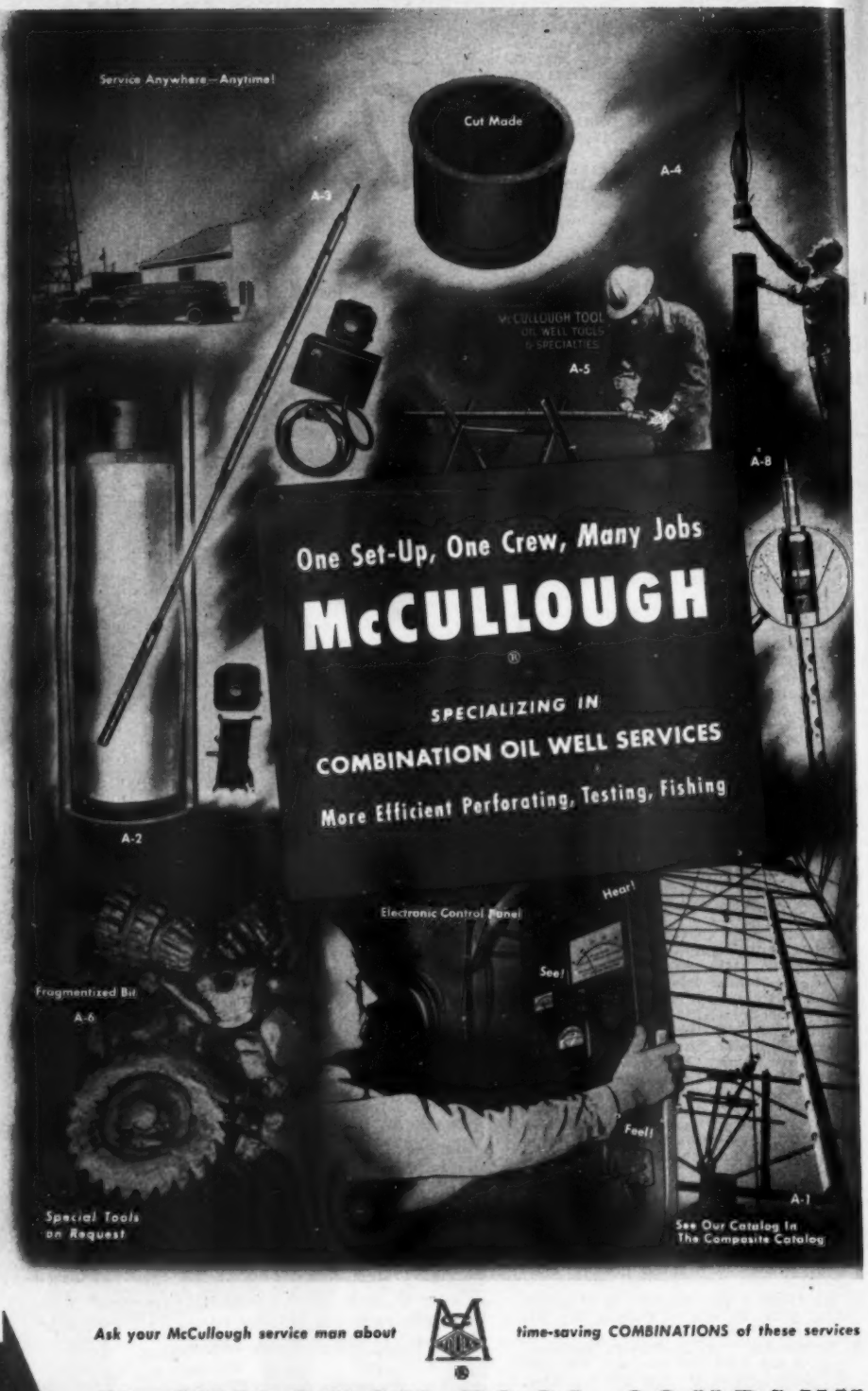

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J. White Sur., A-825, 2 mi. S Frost, dry, TD 1,905 ft., Austin 292-622 ft., Woodbine 947 ft., fresh water in Woodbine.

John W. Hooser and W. W. Lechner 1 W. J. Tramel, Duncan Sur., 7 mi. N Kerens, dry, TD 3,285 ft.

Wood County: O. W. Killam 1 Alf Johnson, F. McMahan Sur., 1½ mi. S Alba, dry, TD 6,508 ft., elev. 405 ft., Pecan 2,457 ft., base Austin 4,148 ft., sub-Clarksville 4,183 ft., Woodbine 4,670 ft., Comanche 5,641 ft., Goodland 6,258 ft., Paluxy 6,315 ft.

Rocky Mountain

Two Julesburg Basin Tests Show Water in Graneros

DENVER.—Two Denver Julesburg Basin wildcats have tested water in sands of the Graneros-Cloverly series. Stanolind Oil & Gas Co. recovered 1,270 ft. of salt water on 45-minute test of the "D" sand between 3,315-48 ft. at its Southeast Alliance well, Garden County, Nebraska. The well is 1 Eldred, NE NE NW 32-20n-45w, approximately 40 miles northeast of the four producing pools in the Sidney area. Stanolind is coring ahead on this well.

Three miles northeast of its Armstrong area discovery British-American Oil Producing Co. has tested water in two sands at 1 Thomas, NE SW SE 13-11n-53w, Logan County, Colorado. On drill-stem test 5,262-73 ft., the well made 3,630 ft. of salt water. A second test at 5,403-08 ft. showed only 15 ft. of mud in 22 minutes. These wells are of importance as locations following extensive seismic operations by the operators in their respective areas.

No additional shows have been reported by Pure Oil Co. at its deep wildcat at 1 Unit, SE NE NW 35-39n-89w, in the Badwater area, Natrona County, Wyoming. The well is now below 15,050 ft. after mud was highly gas cut at 15,016 ft. The operator increased mud weight to 12 lb. and by carrying the weight at that amount has succeeded in coring to the present depth. Cores have shown only sandy shale. It is believed that the well is now in Mesa Verde formation, with the present zone possibly correlating with oil-producing zone in Pure Oil Co.'s West Poison Spider, Wyoming, field. The West Poison Spider field is approximately 35 miles southeast of the Badwater wildcat, and Pure has Frontier sand production at around 14,000 ft. and Mesa Verde production at approximately 9,200 ft. The present well was originally scheduled as a Frontier sand test, following seismic work in this area by Pure.

A show of oil in the Frontier sand has been encountered by Pioneer Drilling Co. and Brinkerhoff Drilling Co. of Casper in their interesting wildcat in the Southeast Meadow Creek area, Johnson County, Wyoming, and the operator is now testing in that formation. The well is 1 Government, NE NE NE 25-41n-78w, 3 miles southeast of Continental Oil Co.'s Lakota sand discovery well in the Meadow Creek area. Second Wall Creek was topped at 6,275 ft. and the operator cored saturation in sand between 6,280-99 ft. The well is now at 6,299 ft., total depth, with operator testing. In the Sussex sand this well showed water, and only mud was recovered in Shannon, with both of the sands producing in some sections of the Sussex-Meadow Creek area. If the well is productive in the Wall Creek sands it is expected to start a fast drilling play through this area between the Salt Creek and Meadow Creek fields.

WYOMING WILDCAT FAILURES

East La Bonte area, Converse County: Bob Phillips 1 fee, SW NW NW 2-31n-71w; 2,007 ft. TD; dry; Base White River 518 ft., Mowry 820 ft., Muddy 1,001 ft., Thermopolis 1,022 ft., Dakota 1,140 ft., Lakota 1,210 ft., Morrison 1,33 ft., Sun-

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dance 1,537 ft., Basal Sundance 1,750 ft., Chugwater 1,818 ft.

Moorcroft area, Crook County: Mule Creek Oil Co. 1 Government, CNE NE 18-49n-68w, 6,694 ft. TD; dry; Muddy 6,271 ft., Dakota 6,514 ft., Lakota 6,606 ft.

East Teapot area, Natrona County: Midland Oil Co. 1 Government-Van Meter, NW SE NE 11-38n-78; 3,556 ft. TD; dry; junked hole; Shannon 968 ft., first Wall Creek (?) 2,170 ft.

Midland Oil Co. 2 Government, CN½ SE NE 11-38n-78w; 2,355 ft. TD; dry, junked hole; Stray sand 2,328 ft.

Wheatland area, Platte County: G. E. Hall 1 Loomis; NE NW NE 3-23n-67w; 1,925 ft., TD; dry; Base White River 1,200 ft., Chugwater 1,300 ft.

COLORADO WILDCAT FAILURE

Green Mountain area, Jefferson County: Sherrod & Apperson 1 Richerts, NW NW NE 23-4s-69w; 6,064 ft. TD; dry.

MONTANA WILDCAT FAILURES

Genou area, Chouteau County: Hunley & Nairns 1 Onstead, SE SE SE 5-25n-5e; 3,949 ft. TD; PB 3,812 ft.; completed as a water well; Red Beds 1,500 ft., Madison 1,988 ft., Devonian 3,128 ft., Potlash 3,160 ft.

Whitewater area, Phillips County: The Texas Co. 2 Unit, CNW¼ 7-33n-32e; 1,035 ft. TD; dry; lost hole; Bowdoin sand 790 ft.

NEBRASKA WILDCAT FAILURE

Dalton area, Cheyenne County: B. B. Carter Drilling Co. 1 Klinge, SE SE NE 27-17n-49w; 4,662 ft. TD; dry; Pierre 1,050 ft., Niobrara 3,647 ft., Ft. Hayes 3,896 ft., Codell 4,004 ft., Greenhorn 4,186 ft., "D" sand 4,516 ft., "J" sand 4,595 ft., J-2 sand 4,643 ft.

SOUTH DAKOTA WILDCAT FAILURE

Wildcat area, Butte County: Tee Pee Buttes Oil Co. 1 Hafnie, NW SW SE 33-9n-7e; 1,400 ft. TD; abd.; collapsed casing.

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Canadian Fields

Gas and Oil Discovery Drills on to Test Devonian

CALGARY.—The Whitelaw discovery well in northwest Alberta is being readied for casing, preliminary to drilling on for tests of Devonian objectives. The well, owned jointly by Shell Oil Co. and British American Oil Co., has already logged a natural gas discovery and a crude oil discovery in what is believed to be Triassic sandstones. The Triassic, not present in the south and central plains of Alberta, but widespread under the northwest sector of the province, has thus become a new source of production, and a new target for the oil and gas seekers.

Shell and British American-Whitelaw 1, LSD 2, 14-82-2w6, is now at 4,139 ft., with latest cores to that level showing dolomite presumed to be equivalent to the Madison formation productive at Turner Valley and several other areas in south and central Alberta. The hole is now being reamed, preliminary to running 9-in. casing to bottom.

Gravity of the Triassic oil has now been officially checked at 26.3°. A series of drill-stem tests at 3,860-3,905 ft. gave substantial rises of water-free oil, with influx rate from the formation calculated between 500-600 bbl. per day. From 3,300-3,833 ft., a series of drill-stem tests had natural gas at variable rates, ranging up to 7,000,000 cu. ft. daily. The combined open flow potential of the 300 ft. or more of pay zone in the section is estimated at around 40,000,000 cu. ft. daily.

Piccadilly - Interleduc - Laguerre 1, west Stettler area well in LSD 6, 14-38-21w4, was swabbed in from the basal Cretaceous sands and, following a brief flow test, was shut in for installation of pump. A commercial crude-oil producer is looked for. It should be on pump in about 1 week, as the first oil well from a Lower Cretaceous pool several miles west of Stettler's Devonian oil field.

The well, on drill-stem test of interval 4,372-78 ft., gave a gas flow rate of 450,000 cu. ft. daily, plus pipe recovery in 40 minutes of 945 ft. of light crude. Casing was set and swabbing commenced. After the well kicked off, it was allowed to flow for 15 minutes, making 5 bbl. in the period. No lengthy open-flow test was run, because of possibility of drawing in bottom water. A pump will be installed immediately, to facilitate restricted operation of the well at market allowable rates.

Nineteen wells were completed in Alberta during the past week, including 15 oil wells, 2 gas wells, and 2 failures. The cumulative total for the year is 355, comprising 266 oil wells, 12 gas wells, and 77 dry holes.

UNSUCCESSFUL WILDCAT

Gulf Romane 1, LSD 1, 32-36-20w4, TD 6,225 ft.

Ohio Fields

Week's Activities Are Year's Peak

COLUMBUS.—Mickley & Workman have drilled in the 1 Richard Staats, just west of Brinkhaven in Section 21, Union Township, Knox County, with 6 bbl. of oil and 150,000 cu. ft. of gas, natural. The showing was in the second Clinton at 2,836-51 ft. The well is to be shot and put on pump. In Jefferson Township, Knox County, W. Patton et al., 4 Charles Steiner, Section 21, made 72 bbl. in 24 hours after a 150-qt. shot.

Brendel Producing 3 Robinson Clay Products, Section 17, Lawrence Township, Tuscarawas County, came in with 800,000 cu. ft.

of gas, natural, but blew down and shut in after shot at 480,000 cu. ft.

D. Bebout et al., got a small well in the Newberg at 2,626-2,725 ft. on M. T. Ruff, Section 18, Congress Township, Wayne County. The well gaged 120,000 cu. ft. of gas, natural, and will be tubed and acidized.

Ed Obermiller et al., have staked a location for a wildcat in the southwest part of Bath Township, Summit County, on Carlos Workman in Lot 81.

Locations and completions for the week hit a new high for the year. Locations totaled 34 from 13 counties while completions totaled 31.

Illinois-Ind.-Ky.

Hamilton County Wildcat Flows Oil While Testing

DISCOVERY of another oil pool in southwestern Hamilton County, Illinois, appears to have been made by George & Wrather and associates at their 1 Droit, SE SE SW 7-7s-5e, which flowed clean oil during a drill-stem test of O'Hara lime at 3,174-85 ft. The test, with tool open 90 minutes, took in a section at 3,154-3,216 ft. Gas showed within 22 minutes after the tool was opened. Oil flowed the last 8 minutes of the test. On the break-down, 2,340 ft. of clean oil was recovered along with 60 ft. of salty oil-cut mud and 720 ft. of salt water. Hole was drilled to 3,389 ft. and 5½-in. casing run to 3,280 ft.

Location of the discovery is about 3 miles east of Thompsonville, Franklin County. It is about a mile southwest of the Cantrell pool, Hamilton County, and about the same distance southeast of the Thompsonville East pool, Franklin County, both of which pools were discovered during 1949.

Walter Duncan 1 U. S. Coal & Coke, NW NW NE 4-6s-3e, which opens another pool in central Franklin County, has been completed on the pump making about 100 bbl. of net oil daily. Production is from Cypress sand at 2,573-93 ft. The discovery, 2 miles north of Benton, is about a mile from nearest production.

R. E. Hupp and associates' discovery well, 1 Crafton-Baskett Heirs, in the NE NE 4-P-25, 5 miles east of Henderson, Henderson County, western Kentucky, is flowing at the rate of about 10 bbl. of clean oil while testing McClosky lime at 2,225-36 ft. The well has not been shot nor acidized. Pumping equipment is being set up. Nearest production is in the Spottsville pool, 2 miles to the northeast. The well also had good showing in the Aux Vases at 2,078-2,118 ft. and the Cypress at 1,934-82 ft.

George & Wrather 1 Weber, NE NE NW 36-2s-10w, 2 miles southwest of Francisco and about ¾ mile west of production of the Barrett-Mitchell pool, Gibson County, Indiana, swabbed 2 bbl. of oil per hour natural while testing Aux Vases lime at 1,878-84 ft., and is being put on the pump for completion. Hole was plugged back to 1,935 ft. from its original total depth of 2,020 ft.

Opening a new pool in the area 4 miles east of Summerville, Pike County, Indiana, and about 3 miles southeast of Oakland City production, Ryan & Sharp 3 Enos Coal, SW SE SE 4-3s-8w, has been placed on the pump making about 100 bbl. of oil daily from Cypress sand at 1,368-80 ft.

The Brownsville pool, 3 miles southwest of Carmi, White County, Illinois, is being extended eastward by Skiles Oil Corp. 1 Finch, NE NW SE 32-5s-9e, where casing has been run to test good oil showings in Cypress sand at 2,806-22 ft. A drill-stem test of this sand yielded 1,100 ft. of clean oil and 100 ft. of oil-cut mud.

ILLINOIS SUCCESSFUL WILDCATS

Edwards County: A. J. Slagter 1 Knaust, SW NE SW 20-1n-10e, IP 171 bbl., lower O'Hara 3,232-39 ft., TD 3,239 ft.

Marion County: H. Luttrell 1 Robb, SE NE SE 19-4n-3e, IP 27 bbl., Benoist 1,910-13 ft., TD 1,917 ft.

White County: C. E. Skiles 1 Alford, NE NW NE 18-6s-11e, IP 119 bbl., Cypress 2,594-2,607 ft., TD 2,607 ft.

ILLINOIS WILDCAT FAILURES

Clark County: Cooksey & English 1 Groves, SW NE NE 14-10n-13w, dry, TD 865 ft.

Clay County: Aurora Gasoline Co. 1 Connell, SW SW SW 24-4n-6e, dry, TD 3,065 ft.

Edgar County: F. B. Cline 1 Arthur, NW SW NW 4-12n-11w, dry, TD 1,253 ft.

P. Spicer 1 Haase, SW SE NE 5-13n-11w, dry, TD 2,139 ft.

Franklin County: Tuley & Carter 1 Zeigler, NW NE SW 11-7s-1e, dry, TD 2,847 ft.

Macoupin County: L. Roy Updike 1 Groves, SE SE SW 14-7n-7w, dry, TD 525 ft.

Wabash County: Ashland Oil & Refining Co. 1 Bradshaw, NW NE NW 22-1n-13w, dry, TD 2,830 ft.

Wayne County: Robinson & Puckett 1 Webb, NE NE NW 36-1s-8e, dry, TD 3,404 ft.

White County: E. A. Obering 1 Parker, NE NE SW 32-4s-8e, dry, TD 3,541 ft.

INDIANA WILDCAT FAILURES

Daviess County: J. V. Dunbar 1 Myers, SE SE SW 5-4n-6w, dry, TD 1,275 ft.

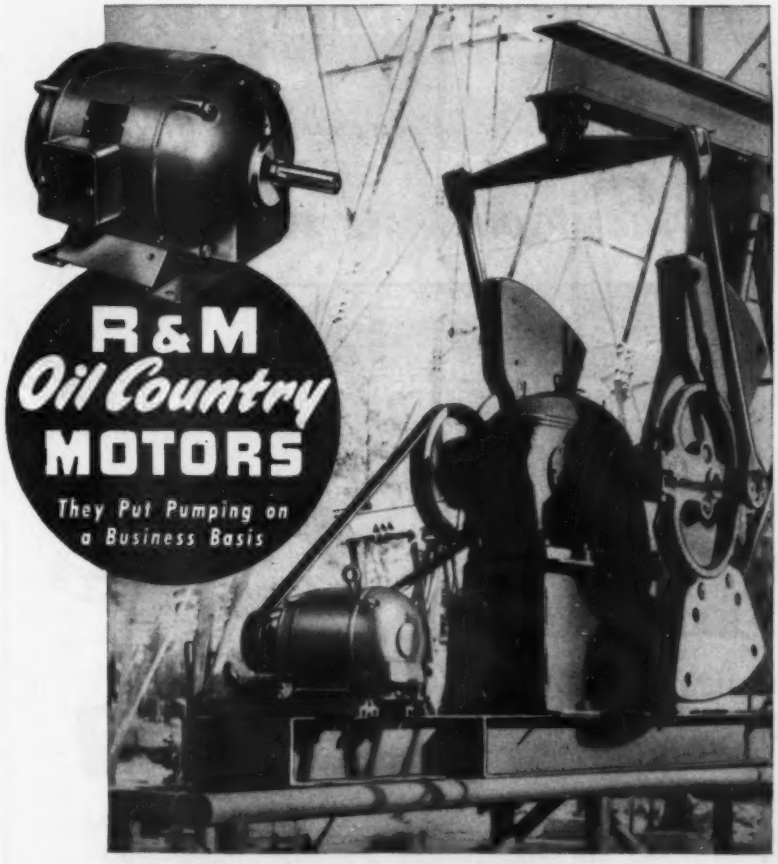
Gibson County: J. F. Balderson 1 Curl, SE SW NW 6-3s-12w, dry, TD 2,180 ft.

Pike County: Ryan & Sharp 2 Enos Coal Co., SE SE SW 6-3s-7w, dry, TD 1,496 ft.

Spencer County: B. & J. Development Co. 1 Tribbie, SW NE NE 2-5s-6w, dry, TD 1,298 ft.

Vanderburgh County: Gilliam Drilling Co. 1 Singleton, SE NW NE 13-5s-11w, dry, TD 2,537 ft.

Vigo County: T & H Corp. 1 Hulman, SW NE SE 31-13n-8w, dry, TD 1,707 ft.



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WESTERN KENTUCKY WILDCAT FAILURES

Daviess County: J. C. Miller Oil Co. and Ashland Oil & Refining Co. 1 Adkins, SW NE NE NW 19-P-32, dry, TD 1,330 ft.
Henderson County: E. F. Moran, Inc., 1 McAtee, NE SE SW SE 2-P-21, dry, TD 2,811 ft.
V-T Drilling Co. 1 Haas, SE NW NW SE 5-P-26, dry, TD 1,517 ft.

EASTERN KENTUCKY

ASHLAND.—In northeastern Estill County and on the east end of the Furnace (Deep) gas pool, Jack Kindred et al 2 George Lyle, 25-P-69, are preparing to run liner at total depth 2,705 ft. First prospective oil well for the area from the St. Peter sand, the test on recent pumpings has shown little oil. Operators are still in the sand (topped at 2,635 ft.) but because of bad cave are running liner before deepening.

In Breathitt County, 1-M-77, United Carbon Co. 4 E. J. Evans is producing at the rate of approximately 50 bbl. per day from Mississippi lime at a total depth of 1,377 ft. Two offsets have been started, one south and one east of the discovery well.

In the Ida May pool in southern Lee County, Doug Parrish is testing 18 David Mays. Corniferous, topped at 1,033 ft., had first oil at 1,070 ft. and again at 1,092 ft. With total depth of 1,110 ft. operators shot with 120 qt. nitroglycerin and are cleaning out after shot.

EASTERN KENTUCKY WILDCAT FAILURE

Jackson County: Doug Parrish 1 Carlos Tincher 23-K-68, dry, TD 1,321 ft., Corniferous 1,169 ft., slight show oil, gas and salt water.

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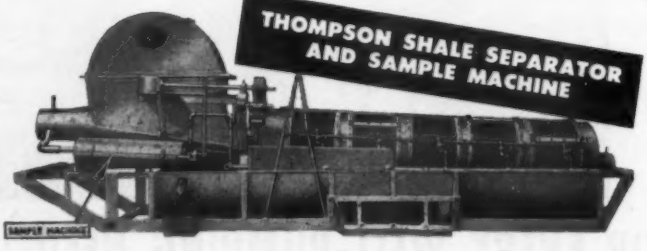

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North Central Texas

Test Passes Flippen Shows To Find Strawn Production

WICHITA FALLS.—Roeser & Pendleton, Inc. completed its Fisher County Strawn discovery for a flowing potential of 101 bbl. of 43°-gravity oil. The new strike is the 1 Mose Newman Industries, located 466 ft. from south and west lines of the southeast quarter, of the northwest quarter of Section 8-20-T&P, and 4½ miles northwest of Eskota. Completion was from open hole below 7-in. casing set at 5,609 ft. and 5,633 ft., total depth, through 10/64-in. choke. Flowing casing pressure was 825 psi. with 330 psi. pressure on tubing. On elevation 2,113 ft., top of the Strawn was 5,600 ft.

The discovery also had possibility of production in the Flippen limestone. A drill-stem test from 3,407-12 ft. recovered 285 ft. of oil and 30 ft. of oil and gas-cut mud in 2 hours. A second test at the same interval, recovered 290 ft. of oil, 90 ft. of oil and gas-cut mud, and 15 ft. of salt water.

Ted Weiner and others 1 R. Campbell, semi-wildcat 2 miles south of Anarene in Archer County, and southwest offset to the 1 Calvin, C. Robertson Survey, A-910, found Mississippian porosity from 5,204-13 ft., total depth. A drill-stem test of the interval had gas in 5 minutes, and flowed oil at the end of the 1½-hour test. Recovery was 4,820 ft. of clean oil, plus 390 ft. of salt water. Casing was being run to total depth for completion.

Application has been filed by Akin & Dimock to drill a semi-wildcat 13 miles southeast of Archer City, and about 1,000 ft. south of Timberlake & Kelleher's 1 Prideaux, a 1949 discovery from the Canyon sand at 2,678-83 ft. The new 3,000-ft. operation is to be the 1 C. C. Prideaux, located 400 ft. from west and 3,050 ft. from south lines of the J. J. Hand Survey, A-181.

A Knox County wildcat, to be located about 3 miles north of Benjamin, was in the planning stage by Sinclair Oil & Gas Co. The operation is to be 1 G. H. Beavers, located 330 ft. from west line and 1,650 ft. from north line of 224-44-H&TC. Projected depth is 6,800 ft. with rotary tools.

Cities Service Oil Co. 1 Huffhines, wildcat 2 miles southeast of Chico and 5 miles southeast of Chico field production, in the W. Hersee Survey, A-410, topped the Ellenburger at 7,045 ft. A drill-stem test from 7,050-98 ft., open 65 minutes, recovered 45 ft. of drilling mud, plus 900 ft. of gas in the pipe. A second test at 7,096-7,181 ft., open 45 minutes, recovered 45 ft. of mud. It was drilling ahead at 7,210 ft.

A. R. Dillard 1 B. F. McKay, wildcat in Fractional Block 3, Falls CSL Survey, had corrected top on the Caddo at 5,602 ft. A 45-minute test from 6,608-38 ft. recovered 45 ft. of mud, and drilling continued below 5,638 ft. Location is 1½ miles northwest of Park Springs.

Mid-Continent Petroleum Corp. 1-B M. S. McBride, W. Burk Survey, A-39, 2 miles south of Paradise, ran a drill-stem test from 5,521-35 ft. Gas showed in 3 minutes, estimated at 3,000,000 cu. ft. daily, and recovery in 1 hour was 60 ft. of distillate-cut mud. A second test from 5,608-29 ft. had gas in 15 minutes, and in 30 minutes recovered 215 ft. of gas-cut mud. Flowing pressure was 550 psi. Operators were to continue testing.

Prospects of the first Caddo oil production in Baylor County were reported at J. J. Lynn 1 First National Bank of Fort Worth, Block 197, T&NO Survey, 10 miles southeast of Seymour. Top of the Caddo was 5,088 ft., drilled to 5,099 ft. A 1 hour drill-stem test on the interval had gas in 17½ minutes and recovered 315 ft. of clean oil, plus 90 ft. of heavily oil-cut mud. Casing was set on bottom for perforating and completion tests. The same operator staked location for the 1-B Claude Cowan, 1 mile south in Block 206, T&NO Survey.

NORTH TEXAS (DISTRICTS 9 AND 7-B) SUCCESSFUL WILDCATS

Archer County: Neeld & Hood Drilling Co. 1-A B. W. Garney, Sec. 1862, TE&L, A-543, 8 mi. E Anarene, TD 3,109 ft., Strawn pay 3,100-09 ft., pumped 90 bbl. of 40°-gravity oil a day.

Brown County: Hickok & Reynolds Royalty Co. 1 J. M. Moore, J. C. Bailey Sur. 137, A-1379, 4½ mi. SE Cross Cut, TD 2,750 ft., elev. 1,504 ft., Ellenburger 2,701 ft., pay 2,712 ft., 4,000,000 cu. ft. of gas a day, SIP 800 psi.

Hickok & Reynolds 1 G. W. Williams, John Beck Sur. 792, A-47, 4½ mi. SE Cross Cut, TD 1,481 ft., Fry sand pay 1,473 ft., 8,500,000 cu. ft. of gas daily, SIP 600 psi.

Jack County: Hanlon Boyle, Inc. 1 Laura Norman, S. R. Holly Sur., A-1748, 5 mi. SW Brywon, TD 4,400 ft., PB 4,080 ft., PB 4,080 ft., elev. 1,191 ft., Caddo pay 4,040 ft., pumped 13½ bbl. of 42°-gravity oil a day.

Parker County: Thomas W. Doswell 1 R. E. L. Harrison, Eliajah Harrison Sur., A-687, 16 mi. SW Weatherford, TD 5,078 ft., PB 2,390 ft., perf. 2,370-90 ft., 3,000,000 cu. ft. of gas daily, Caddo 2,655 ft., Marble Falls 3,948 ft., Ellenburger 4,995 ft.

NORTH TEXAS (DISTRICTS 9 AND 7-B) WILDCAT FAILURES

Archer County: Bridwell Oil Co. 3-K L. F. Wilson, Blk. 62, ATNCL Sur., 10 mi. NE Archer City, dry, TD 4,150 ft., had gas and salty mud on DST 3,850-77 ft.

Fain & MaGaha 1 Will Sternadel, J. B. McDonell Sur., A-282, 4 mi. S Witchita Falls, dry, TD 4,797 ft., oil shows 4,778-97 ft.

Russell Maguire 1 C. L. Abercrombie, E. Polk Sur., A-782, 8 mi. W Anarene, dry, TD 5,159 ft., Caddo 4,687 ft.

Palmer Drilling Co. 1 Mangold, Blk. 12, Mangold Subd., McKinney & Williams Sur., 1 mi. N Mankins, dry, TD 1,850 ft.

C. L. Shive 1 Florence Anderson, Blk. 23, Anderson South Pasture Subd., 10 mi. NW Olney, dry, TD 1,503 ft., elev. 1,295 ft., Gunsight 1,411 ft.

Callahan County: Robinson-Puckett, Inc. 1 T. I. Nixon, Sec. 63, BBB&C Sur., 2 mi. SW Clyde, TD 4,814 ft., elev. 2,019 ft., Valera 478 ft., Dothan 1,340 ft., Saddle Creek 1,642 ft., Flippen 1,682 ft., Cook sand 1,760 ft., Bunger 2,229 ft., Canyon 2,530 ft., Palo Pinto 3,048 ft.

Clay County: R. H. Banner Drilling Co. 1 D. G. Lyon, Blk. 119, Byers Bros. Subd., 1 mi. NW Byers, dry, TD 1,856 ft.

L. T. Burns 3 H. Sanzenbacher, T. F. Bates Sur., A-13, 3 mi. SE Bluegrove, dry, TD 6,432 ft., sand with oil show 4,198-4,220 ft., dry lime 6,095 ft.

Scott & Timberlake 1 R. B. Stine, Blk 19, Parker CSL, 4 mi. SE Petrolia, dry, TD 1,927 ft.

Comanche County: J. J. Lynn 1 V. D. Benson, Blk. 82, Lge. 1, Lampasas CSL, A-607, 4 mi. S Sipe Springs, dry, TD 3,048 ft., Marble Falls 2,498 ft.

Haskell County: T. D. Humphrey 1 E. H. Burnett, Joseph Shepard Sur. 56, A-367, 7 mi. NE Haskell, dry, 3,620 ft.

T. D. Humphrey 2 H. A. Lewellen, Blk. 58, J. Campbell Sur., A-91, 7 mi. NE Haskell, dry, TD 3,252 ft.

T. D. Humphrey 1 V. W. Meadors, J. N. Gaines Sur., 54, A-142, 4 mi. SE Haskell, dry, TD 5,540 ft., elev. 1,513 ft., DST 3,655-75 ft., recovered gas, oil, and salt water.

Jones County: W. C. Butler 1 B. Dougherty, C. B. Greenwood Sur. 202, 10 mi. SW Anson, dry, TD 2,272 ft., elev. 1,711 ft.

Chalmette Petroleum Corp. et al 1 C. E. Young, Blk. 2, Lge. 359, Goliad CSL, 14 mi. W Anson, dry, TD 3,391 ft. in shale and lime.

Farris Oil Co. 1 G. W. Willis, Sec. 23, HT&B Sur., 3 mi. W. Leuders, dry, TD 2,783 ft., elev. 1,020 ft., Dotham 1,460 ft., Noodle Creek 1,550 ft., reef 2,780 ft.

Montague County: R. J. Caraway 1 A. B. Cardwell, Blk. 31, J. Y. Castillo Sur., 2 mi. E Belcherville, dry, TD 5,747 ft.

Konrad Sztykgold 1 O. W. Charles, Mary Burnside Sur., A-14, 6 mi. NE Nocona, dry, TD 5,384 ft.

Stonewall County: C. L. Norsworthy, Jr. 1 W. E. Green, SE NE 99-F-H&TC, 3½ mi. N Aspermont, dry, TD 6,705 ft., elev. 1,725 ft., Sedwick 2,760 ft., Dothan 2,940 ft., Saddle Creek 3,210 ft., Flippen 3,280 ft., Swastika 4,090 ft., Strawn 5,486 ft., Mississippian 6,110 ft., Ellenburger 6,382 ft., Hickory sand 6,580 ft., pre-Cambrian 6,704 ft., DST 6,198-6,228 ft. had 570 ft. of 38°-gravity oil.

Taylor County: Connally-Thornton 1. E. L. Hamilton, 33-16-T&P, 4 mi. W Abilene, dry, TD 2,510 ft., elev. 1,734 ft., King sand 2,384 ft.

Wilbarger County: S. H. Walton 1 E. W. and Roy C. Potts, 12-7-H&TC, 10 mi. SW Electra, dry, TD 2,208 ft.

Young County: Cortez & Criswell 1 Graham & Stewart, J. L. Steen Sur., A-1824, 10 mi. E Olney, dry, TD 5,357 ft., Caddo 4,490 ft.

Keller Named Manager of Penn Sales Engineering

Penn Industrial Instrument Corp. of Philadelphia, manufacturers of flow meters, temperature and pressure recorders, and controllers, has announced the appointment of George D. Keller as manager, sales-engineering department.

Keller's experience includes 4 years of engineering and production work with the War Department, Philadelphia Ordnance district; and 4 years in the sales and engineering departments of Worthington Pump & Machinery Corp.

When all factors are considered, Carlon Plastic Pipe will reduce transmission costs. The dense smooth internal surface of plastic pipe reduces friction between fluid and walls, and less fluid turbulence is created by internal surface irregularities.

Less semi-solids adhere to internal walls, so full line capacity is utilized. This decreases pressure losses from internal obstructions.

Actual tests proved that head loss is much less in Carlon Plastic Pipe. In many cases a smaller diameter plastic line will carry the same volume of fluid as a larger diameter conventional line.

CARLON
is practical for—

- DISPOSAL TUBING
- GATHERING LINES
- WATER LINES
- SIPHON LINES
- LEAD LINES
- GAS LINES

WRITE FOR COMPLETE INFORMATION

GREEN CONTRACTING AND ENGINEERING CO., INC.

103 SOUTH VINE . . . WICHITA, KANSAS

CARTER PRODUCTS CORPORATION, CLEVELAND, OHIO, MFRS.

XUM

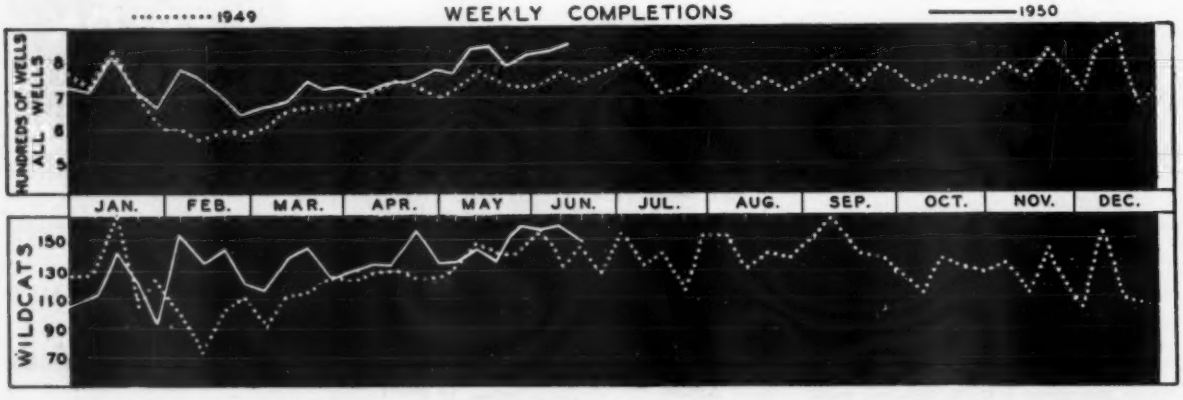
CURRENT STATISTICS

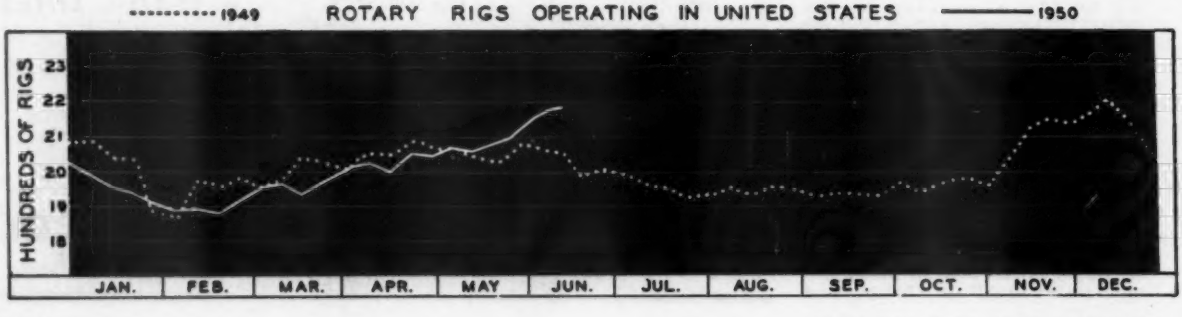
EXPLORATION

WEEKLY WELL COMPLETIONS . . . . WEEK ENDED JUNE 17, 1950

	Total of all wells					June 17		Wildcat completions and discoveries					Cumulative total, 1950				
	Comp.	Oil	Gas	Dry	Footage	1950	1949	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	5	3	0	*2	5,264	195	576	0	0	0	0	0	0	0	0	0	0
Pennsylvania	13	3	6	*4	32,397	449	902	0	0	0	0	0	0	0	0	2	2
West Virginia	11	5	4	2	22,560	298	229	0	0	0	1	1	0	0	10	12	22
Ohio	31	9	10	*12	71,096	438	518	0	0	0	0	0	1	0	1	6	8
Indiana	33	11	1	21	53,706	607	566	0	0	0	6	6	15	0	1	114	130
Kentucky	25	8	6	11	47,563	416	403	0	0	0	4	4	7	0	1	32	40
Illinois	64	34	0	30	144,956	1,116	1,085	3	0	0	9	12	24	0	1	246	271
Michigan	18	3	0	†15	36,568	357	415	0	0	0	5	5	17	0	4	118	139
Kansas	97	50	16	31	309,264	1,866	1,405	2	0	0	14	16	42	0	2	266	310
Nebraska	2	0	0	2	7,662	37	15	0	0	0	2	2	0	0	1	16	17
Oklahoma	98	59	12	27	341,999	2,393	1,913	4	0	0	8	12	71	5	8	301	385
Texas	292	184	12	96	1,300,543	7,117	6,164	7	1	4	53	65	215	16	58	1,132	1,421
N. Central (Dist. 7-B & 9)	87	39	3	‡45	267,373	2,214	1,977	2	0	3	23	28	87	2	17	435	541
West (Dist. 7-C & 8)	61	57	0	4	343,314	2,051	1,429	0	0	0	2	2	47	1	1	222	271
Panhandle (Dist. 10)	11	7	3	1	37,806	427	476	0	0	0	1	1	1	0	2	10	13
Eastern (Dist. 5, 6, & 6-P)	47	36	0	11	173,513	523	421	0	0	0	8	8	8	3	1	99	111
Gulf Coast (Dist. 2 & 3)	44	26	2	16	273,641	997	893	2	1	1	9	13	36	6	21	150	213
Southwest (Dist. 1 & 4)	42	19	4	19	204,896	905	968	3	0	0	10	13	36	4	16	216	272
Louisiana	53	29	9	15	266,237	1,071	934	0	0	0	3	3	26	8	4	84	122
Northern	38	21	9	8	123,029	559	488	0	0	0	1	1	4	1	1	35	41
Southern	15	8	0	7	143,208	512	446	0	0	0	2	2	22	7	3	49	81
Arkansas	11	6	0	5	38,587	170	134	0	0	0	5	5	3	0	0	43	46
Mississippi	6	3	0	3	37,413	150	176	0	0	0	1	1	8	2	0	52	62
Southeastern States	1	0	0	1	3,333	28	22	0	0	0	0	0	0	0	1	17	18
Montana	16	11	0	5	30,335	83	100	0	0	0	2	2	1	0	0	11	12
Wyoming	20	9	0	11	88,464	257	269	0	0	0	5	5	8	0	0	30	38
Colorado-Utah	1	0	0	1	6,064	30	53	0	0	0	1	1	0	0	0	22	22
New Mexico	14	12	2	0	61,072	287	265	1	0	0	0	1	10	1	0	23	34
California	39	31	1	7	180,362	787	1,231	1	0	0	5	6	11	0	2	158	171
Miscellaneous	1	0	0	1	1,400	8	15	0	0	0	1	1	0	0	0	8	8
Total United States	851	470	79	302	3,086,845	17,960	17,390	18	1	4	125	148	459	32	94	2,693	3,278
Total previous week	833	457	60	316	2,964,052	.....	.....	20	2	7	133	162	441	31	90	2,568	3,130
Total June 17, 1949	757	404	47	306	2,591,698	.....	.....	15	2	2	126	145	407	44	82	2,485	3,018

Service wells included: *2, †6, ‡1.





DAILY AVERAGE PRODUCTION FOR WEEK

	June 17 crude oil	B. of M. June demand	June 10 crude oil
Alabama	1,750	1,800	1,750
Arkansas	79,450	87,000	78,900
California	872,100	850,000	870,200
Colorado	59,500	65,000	58,900
Eastern	61,950	62,000	60,800
Florida	1,500	1,200	1,500
Illinois	172,300	186,000	169,900
Indiana	29,500	28,000	31,800
Kansas	281,550	285,000	253,400
Kentucky	25,500	27,000	26,400
Louisiana	562,875	560,000	563,825
North Louisiana	118,150	.....	119,100
South Louisiana	444,725	.....	444,725
Michigan	45,800	46,000	47,100
Mississippi	104,750	103,000	98,900
Montana	22,800	25,000	23,200
Nebraska	2,100	3,000	2,000
New Mexico	126,675	144,000	126,675
Oklahoma	421,000	438,000	419,950
Texas	2,244,450	2,120,000	2,244,450
Dist. 1 (Southwest)	28,275	.....	28,275
Dist. 2 (Southwest)	132,700	.....	132,700
Dist. 4 (Southwest)	209,950	.....	209,950
Dist. 3 (Gulf Coast)	403,500	.....	403,500
Dist. 5 (Eastern)	33,925	.....	33,925
Dist. 6 (Eastern)	88,575	.....	88,575
East Texas field	282,000	.....	282,000
Dist. 7-C (West)	53,275	.....	53,275
Dist. 8 (West)	708,825	.....	708,825
Dist. 7-B (W. Central)	69,325	.....	69,325
Dist. 9 (N. Central)	141,850	.....	141,850
Dist. 10 (Panhandle)	92,250	.....	92,250
Utah	3,400	4,000	3,500
Wyoming	160,200	154,000	163,100
Total United States	*5,279,150	5,190,000	5,246,250
Change from previous week, up 32,900			
Canada	63,620	.....	61,400

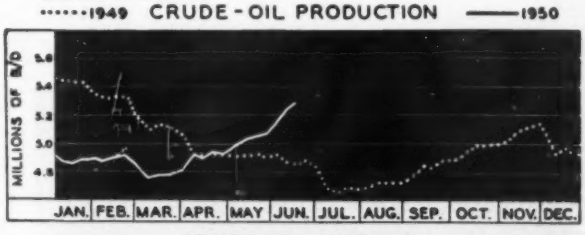
Total U. S. production January 1-June 17..... †846,076,455 bbl.
Same period last year (crude plus cond.) ..... 873,941,420 bbl.

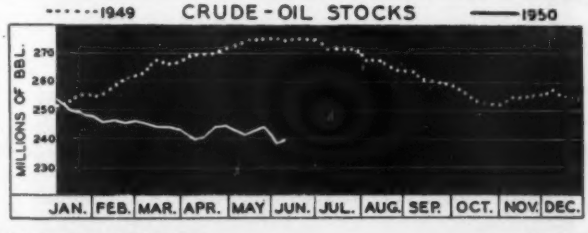
*Not including 104,205 bbl. condensate. †Including 16,324,980 bbl. condensate.

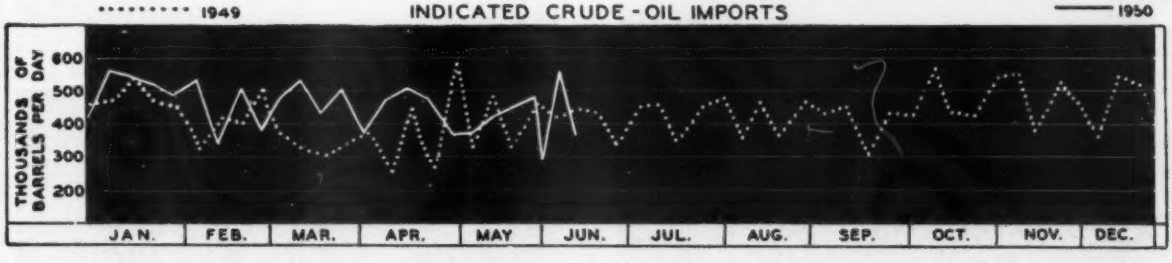
CRUDE-OIL STOCK BY STATES OF ORIGIN*
(Thousands of barrels)

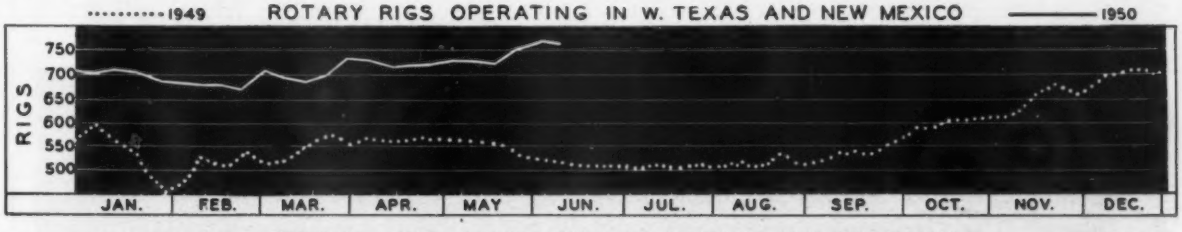
	June 10, 1950	June 3, 1950	June 11, 1949
Pennsylvania Grade	2,860	2,899	3,063
Other Applachian	1,570	1,693	2,085
Illinois, Indiana, Michigan	9,537	8,936	14,275
Arkansas	2,883	2,838	3,031
Louisiana	15,189	14,599	14,992
North	3,299	3,683	3,227
Gulf	11,890	10,916	11,765
Mississippi	1,951	1,952	3,418
New Mexico	5,893	5,537	7,542
Oklahoma and Kansas	35,149	34,756	40,027
Texas	109,469	109,217	127,638
East Texas	15,285	15,047	17,750
West Texas	40,284	40,199	51,223
Texas Gulf	26,925	26,624	30,053
Other Texas	26,975	27,347	28,612
Rocky Mountain	12,679	13,161	14,326
California	36,327	36,683	35,297
Foreign	5,957	6,501	8,132
Total	239,464	238,772	273,826

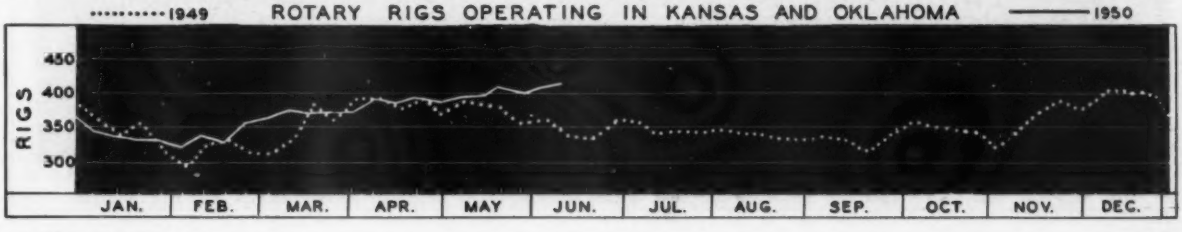
*Bureau of Mines.











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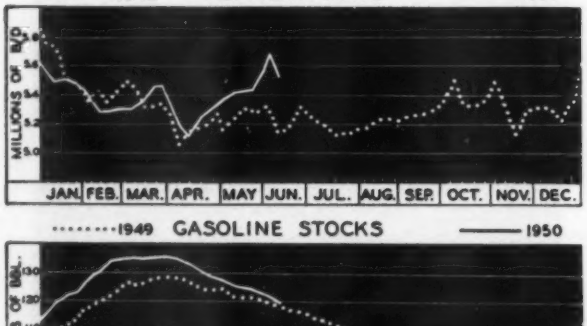
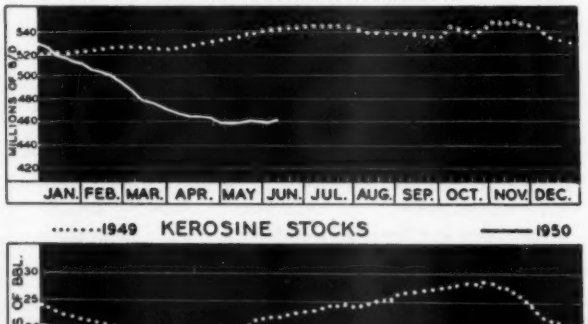
A.P.I. REFINERY REPORT, JUNE 10

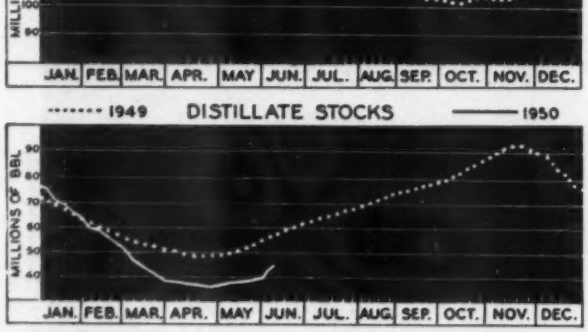
(Thousands of barrels)

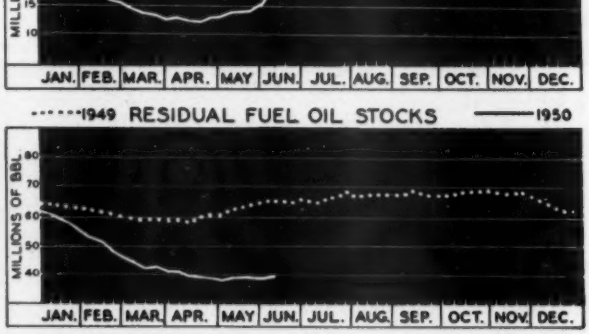
District—	Daily avg. crude runs	Daily average production				Stocks at refineries, bulk terminals, in transit and in pipe lines				Bureau of Mines, June 1949				
		Gasoline*	Kerosine	Distillate	Residual	Gasoline†	Kerosine	Distillate	Residual	Daily avg. crude runs	Daily average production: Gasoline*	Kerosine	Distillate	Residual
East Coast	912	423.3	40.4	170.0	199.9	26,916	6,139	11,150	9,536	694	285.9	24.3	114.0	143.9
Appalachian:														
District 1	87	37.4	2.6	12.1	10.1	2,439	370	510	359	90	42.8	3.1	8.5	6.3
District 2	71	30.1	4.3	8.1	14.7	838	106	153	117	58	29.9	1.8	4.7	10.7
Ind., Ill., Ky.	1,041	556.7	67.3	142.7	144.0	23,776	3,355	6,615	2,920	865	487.6	40.8	103.3	121.3
Okla., Kans., Mo.	468	258.7	9.0	103.9	59.9	12,489	990	3,961	1,069	423	236.1	18.8	81.3	57.2
Inland Texas	199	135.7	9.9	28.6	41.3	3,448	400	836	810	217	161.5	11.6	19.2	45.6
Texas Gulf Coast	1,134	536.7	79.6	235.1	220.7	17,893	2,960	6,853	4,104	1,236	647.8	68.5	170.1	224.9
La. Gulf Coast	434	223.6	44.3	102.1	49.7	5,710	2,493	2,917	1,686	401	215.5	29.9	94.0	41.8
N. La. and Ark.	73	29.3	8.7	12.4	13.9	2,746	391	480	221	76	32.8	6.2	11.9	15.9
Rocky Mountain:														
New Mexico	13	7.6	0.4	1.9	2.9	117	25	52	32	11	5.8	0.3	1.8	2.7
Other Rocky Mtn.	193	85.9	5.1	38.3	31.7	4,894	333	1,504	560	170	77.1	4.7	30.2	31.3
California	899	393.4	2.1	139.2	255.1	17,983	937	10,199	17,778	921	373.8	13.8	132.2	339.0
June 10, 1950	5,524	2,718.4	273.7	994.4	1,043.9	119,249	18,499	45,230	39,192	5,162	2,596.6	223.8	771.2	1,040.6
June 3, 1950	5,688	2,722.1	317.3	1,026.7	1,073.9	121,087	17,369	42,449	38,991	.....	.....	.....	.....	.....
June 11, 1949	5,153	2,520.1	231.0	815.9	1,186.4	117,484	22,006	60,402	65,901	.....	.....	.....	.....	.....

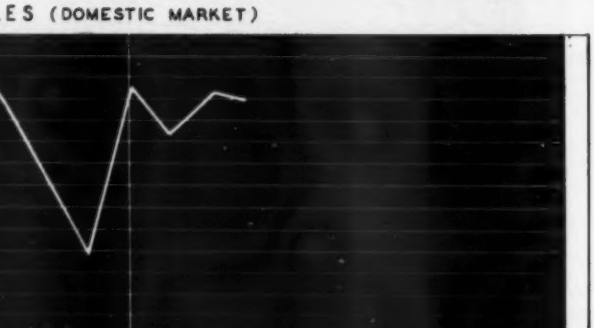
*At refineries including natural blended. †Finished and unfinished.











MOTOR VEHICLE SALES (DOMESTIC MARKET)
DAILY AVERAGE: THOUSANDS
WAR PERIOD
39 40 41 45 47 48 J F M A M J J A S O N D J F M A M J J A S O N D
1949
1950

CRUDE PRICES

GRAVITY SCHEDULE

Gravity—	Signal Hill, Calif.	Okla-homa, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.53	....	....	....
19-19.9	1.63	....	....	....
20-20.9	1.73	$2.25	....	$2.12
21-21.9	1.82	2.27	....	2.14
22-22.9	1.92	2.29	....	2.16
23-23.9	2.02	2.31	....	2.18
24-24.9	2.12	2.33	$2.56	2.20
25-25.9	2.22	2.35	2.58	2.22
26-26.9	2.31	2.37	2.60	2.24
27-27.9	2.37	2.39	2.62	2.26
28-28.9	2.42	2.41	2.64	2.28
29-29.9	2.48	2.43	2.66	2.30
30-30.9	2.54	2.45	2.68	2.32
31-31.9	2.59	2.47	2.70	2.34
32-32.9	2.64	2.49	2.72	2.36
33-33.9	....	2.51	2.74	2.38
34-34.9	....	2.53	2.76	2.40
35-35.9	....	2.55	2.78	2.42
36-36.9	....	2.57	2.80	2.44
37-37.9	....	2.59	2.82	2.46
38-38.9	....	2.61	2.84	2.48
39-39.9	....	2.63	2.86	2.50
40 and above	....	2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point.

†Includes Lea County, New Mexico. Last general price change represented a 50-cent increase becoming effective December 6, 1947. Above changes do not include recent reductions of a few buyers applying principally to low-gravity grades.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

East Texas†	2.65
Kettleman Hills, California*	2.77
Beauregard Parish	2.60
Illinois Basin	2.77
Pecos County, Texas (Yates)	2.35
Bradford, Pennsylvania	3.65
Eastern Ill. and Western Ind.†	2.77
Tomball, Texas Gulf Coast	2.83

*37°-37.9°. †35° and above.

GASOLINE markets continue strong in all areas with prices slightly higher in the New York Harbor area and unchanged for the week in the Group 3 shipping districts.

Increased demand for gasoline in recent months, compared with last year, has been supplied by additional runs at refineries with smaller relative portions of the gains coming out of storage. Total gasoline stocks dropped 7,607,000 bbl. in the 4-week period ended May 13 but only 6,602,000 bbl. during the 4 weeks ended June 10.

Refinery production of gasoline for 2 weeks ended June 10 was 6.1 per cent greater than in the same weeks of 1949, but if this is carried back for 4 weeks, the gain is 4.0 per cent. For the 4-week period ended May 13, the production increase over last year was only 2.3 per cent.

In general, rapid depletions of inventories tend to promote price increases. Since a larger part of the gain in demand is being supplied by increased production, gasoline prices have tended to level off in recent weeks. If gasoline demands move up enough to cause stock reductions of better than 2,500,000 bbl. weekly, prices will be affected.

Kerosine prices in the New York Harbor area have shown some seasonal weakness, but the shortage of bids covering a year's supply of kerosine for New York City indicates that most suppliers are not expecting any big kerosine surplus within the next 12 months.

Residual-fuel inventories have changed very little in the past 8 weeks and are almost 27,000,000 bbl. less than last year. The big question in the heavy-fuel market is whether prices will go up, driving some customers back to coal, or remain at present levels with shortages as a prospect for next winter.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of June 19, 1950. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline, 80-82 octane	10⅛-10⅜	12.25	10½-10⅞
Premium gasoline, 86-88 octane	10¾-11½	13.25	11⅜-11⅝
42-44 w.w. kerosine	8⅜-8⅝	8.9-9.1	8-8½
No. 2 straw fuel oil	7½-7¾	7.6-8.0	7-7¼
No. 6 residual	$1.65-1.70	$2.05	$1.65-1.80

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5⅛	4⅝	4⅞
Grade 18-55	6.15	5.65	5.9

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	10.5-11.5
750 vis., No. 3-4 neutral	12.75-13.75
2,000 No. 5-6 neutral	14.5-15.5

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18-18.5
200 vis., No. 3 neutral, 0-10 pp.	12.5

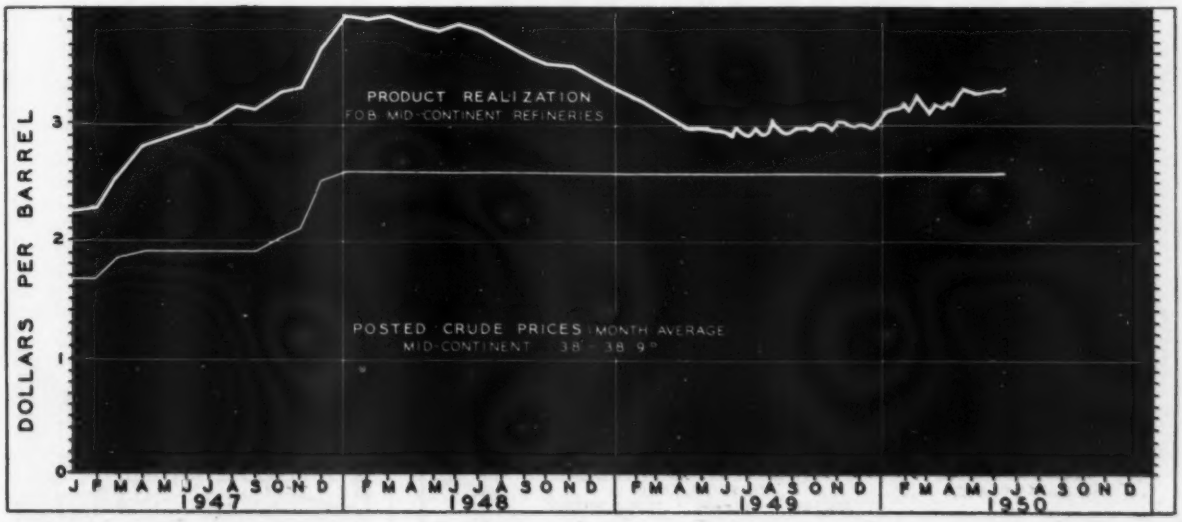
Western Pennsylvania

145-155 vis., 10 p.t. bright stock	20.5
180 vis., 0 p.t. neutral	21.5

WAX

Mid-Continent

132-134 A.M.P.	4.50


PRODUCT REALIZATION
F.O.B. MID-CONTINENT REFINERIES
POSTED CRUDE PRICES 1 MONTH AVERAGE
MID-CONTINENT 38° - 38.9°
DOLLARS PER BARREL
0
1
2
3
J F M A M J J A S O N D
1947
F M A M J J A S O N D
1948
F M A M J J A S O N D
1949
F M A M J J A S O N D
1950

In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate, and fuel oil. Realization averaged $3.35 for week ended June 10, $3.31 for previous week, and $2.97 for June 1949.

NOW OVER 126

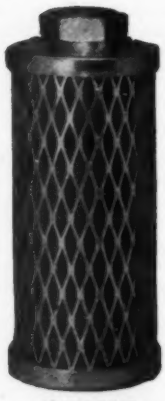
MANUFACTURERS MAKE

MARVEL SYNCLINAL FILTERS

THEIR O.E.M. CHOICE

LINE TYPE

These efficient, versatile filters adapt readily to all installation needs, give more filtering area in same space than like size circular units. Both sump and liquid line types operate at full efficiency in any position and can be installed at the angle most convenient for your machine. Either type may be disassembled, cleaned and reassembled in minutes. Removing a single handnut on the line model releases the housing for a quick cleaning without disturbing pipe fittings. Adaptable to your needs in every way, Marvel Synclinal Filters are available with wire mesh sizes from coarse 30 to fine 200. Individual capacities are from 5 to 20 g.p.m., and greater capacities are obtainable by multiple installations.



SUMP TYPE

For efficient filtration of non-corrosive liquids in all hydraulic or low pressure circulating systems Marvel has your answer. Write for catalogs 104 and 202.

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625 W. Jackson Blvd. Dept. 81 Chicago 6, Ill.

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- ★ 3 standard types; choice of 24 hour or 7-day movement.

Model "500" Temperature Recorder. Priced from $37.50.

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TOLEDO 1, OHIO
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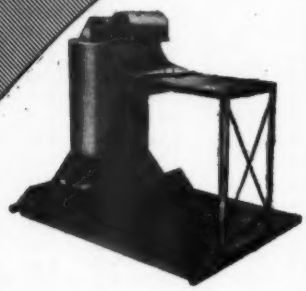
INDICATING & RECORDING THERMOMETERS

SHAVE MUDCOSTS-

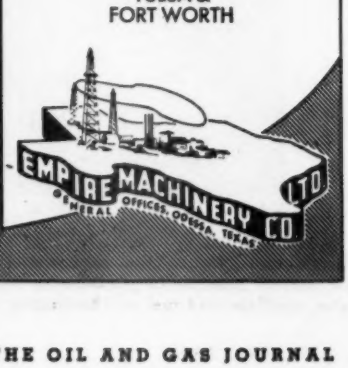


Save Time

Fewer sacks in the stack mean lower costs on the job! A reduction of sacked mud costs that reaches 20% to 50% is not unusual when you use an Empire METERING Mud Mixer. There is no chance for the mud to settle out in the pit, because it goes from the jet to the pump suction, where it is immediately pumped into the well, giving more effective results. Drilling dollars are at stake . . . so stake your claim to savings on an Empire METERING Mud Mixer.

BRANCHES AT
SNYDER & ABILENE

SALES OFFICES:
TULSA &
FORT WORTH



EQUIPMENT MEN . . . in the News

Employes Buy Controlling Interest in Core Lab

J. D. WISENBAKER

Core Laboratories, Inc., Dallas, has announced the purchase of controlling interest in the 14-year-old petroleum-reservoir-engineering firm by a group of its employes. Case-Pomeroy & Co., of New York, founders of Core Lab, will continue in part ownership.

John D. Wisenbaker, newly elected president of the company, stated that no major changes in the organization's various services, policies, and personnel assignments are contemplated in the immediate future. Members of the employe-owner group will continue to serve in their respective field and administrative positions.

Stuck Joins Glenn Mason Agency as an Associate

Goodloe R. Stuck, formerly advertising manager of J. B. Beaird Co., has joined the Glenn Mason advertising agency of Shreveport as an associate. Stuck has been in the advertising and public-relations fields since 1932.

Stuck worked in New York City in the advertising department of Macy's and for the J. Walter Thompson advertising agency until 1939 when he opened his own advertising business in Dallas.

Chicago Bridge Moves San Francisco Office

The San Francisco sales office of Chicago Bridge & Iron Co. has been moved from 22 Battery Street to 200 Bush Street.

L. A. Elsener is manager of Chicago Bridge & Iron's San Francisco office. He is assisted by K. W. Lange, contracting engineer.

Van Cleave Moves Up With U. S. Steel Supply Co.

The election of Paul C. Van Cleave as vice president, sales, of United States Steel Supply Co. has been announced by L. B. Worthington, president. He also has been elected a director of this warehousing subsidiary of U. S. Steel.

Van Cleave, who for the past year and a half has been district manager of the Los Angeles warehouse of the supply company, will assume his new duties on July 1, succeeding Marcus J. Aurelius, who was elected as vice president, sales, of Columbia Steel Co., another U. S. Steel subsidiary. He is a graduate of University of Colorado school of business administration.

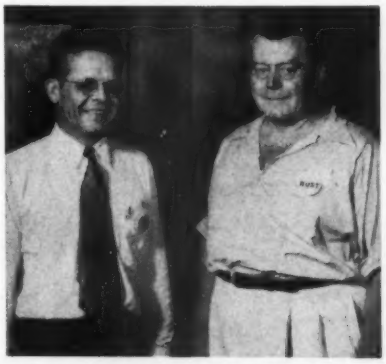
Platts Elected Executive Vice President of Joy

E. M. PLATTS

Joy Manufacturing Co. has announced that E. M. Platts, sales vice president, has been elected executive vice president to succeed the late Arthur S. Knoisen.

Platts joined Joy Manufacturing in 1945 and his first position with Joy was vice president in charge of coal-equipment sales. Two years later he was elected to Joy's board of directors and placed in charge of all sales. Platts began his business career with Jones & Laughlin Steel Corp. in 1913.

Zink Sponsors Process Heating Seminar



John Zink Co., Tulsa, manufacturer of burners for industrial and heating boilers and air heaters, on June 10 sponsored the first Annual Process Heating Seminar in the interest of better engineering and operating practices in refineries and chemical plants. About 135 process engineers from the petroleum industry attended the first seminar which will become an annual meeting, repeated every year. Above, Robert Reed, chief engineer, John Zink Co., who is responsible for originating the seminar, discusses the first meeting with John Zink, head of the firm.

W. J. Bovaird Goes to Midland for Supply Company

Bovaird Supply Co. has announced the transfer of W. J. (Bill) Bovaird from Odessa to Midland, Tex., as sales representative for the Midland area.

Bovaird has been sales representative out of the Odessa store for the past year and prior to that was sales representative at Russell, Kans.

A. O. Smith Makes Changes In West Coast Sales Staff

Changes in the West Coast sales organization of A. O. Smith Corp. of Milwaukee has been announced by district administrator R. L. Howes.

Harry M. Evans was named manager of the San Francisco branch. Evans has had extensive experience in the oil, natural-gas, and allied industries, with previous affiliations including Standard Oil Co., Fluor Corp., and Southern California Gas Co. Evans replaces J. J. Stahl, who was appointed assistant western sales manager of the A. O. Smith motor division at Los Angeles.

Kennedy Elected Vice President of Kennedy Valve

J. Lawrence Kennedy has been elected vice president and secretary of Kennedy Valve Manufacturing Co., Elmira, N. Y. He has also been elected to the board of directors of the company. Before joining the Kennedy organization in 1949, he was vice president of Charles L. Rumrill & Co., Rochester, N. Y., advertising agency.

Geo. J. Fix Expands To Include Houston

Geo. J. Fix Co., Dallas, distributor of power-transmission and material-handling equipment, has announced the opening of a branch office of the firm in Houston.

L. R. Scaff, until recently district representative in Dallas for Continental Gin Co., industrial division, is in charge of the new Houston office. The branch will maintain a large line of stock gears, speed reducers, and other power-transmission equipment,

XUM

including gear motors, V-belt and fluid drives, roller chains, sprockets, electric motors, and hoists.

Manufacturers represented by the firm include Boston Gear Works; Allis-Chalmers Manufacturing Co.; Robbins & Myers, Inc.; Baldwin-Duckworth Division, Chain Belt Co.; and Reeves Pulley Co.

Coote Named as Eastern Outlet for Gorman-Kupp

CHARLES COOTE

The appointment of the Chas. W. M. Coote Co., Inc., as its eastern representative to serve the petroleum industry has been announced by Kenneth H. Cadigan, vice president in charge of sales, Gorman-Rupp Co., Mansfield, Ohio.

Chas. W. M. Coote Co. is located in West Orange, N. J. Sale of Gorman-Rupp products to the major oil companies of the New York metropolitan area will be handled by the Brand-Welch Sales Co. of New York City.

Chas. W. M. Coote, head of the Chas. W. M. Coote Co., has a long record of service in the petroleum industry, having started his work in 1933 in the laboratories of Standard Oil Co. (N. J.). In 1940 he was made automotive engineer with Standard-Vacuum Oil Co., and that year transferred his activities to the Davisbilt Products Co., in Cincinnati.

In 1948, he entered the pump field and established his own firm in 1949. This new firm was established to distribute petroleum-handling equipment.

Vulcan Announces Change In Firm's Corporate Name

In order to bring the name of the company into closer accord with the products manufactured, Vulcan Proffing Co. has changed its corporate name to Vulcan Rubber Products, Inc. There has been no other change in the organization of the company.

Republic Supply Installs Two New Sales Points

Republic Supply Co. has recently opened a new store at Harvey, La., and a sales office at New Orleans.

The Harvey store is managed by J. P. Smith, II, and he is assisted by M. T. Maloney and W. B. Pattillo.

The New Orleans office is located in the International Trade Mart Building, and is under the direction of Jack Halbert.

Both sales points are under the supervision of W. M. Haynes, refinery-sales manager for Republic.

Thomas Bryan Opens New York Office

R. B. DOREMUS

Thomas Bryan & Associates, Inc., of Houston, engineers and constructors, has announced the opening of its New York branch office with Rodman B. Doremus of Greenwich, Conn., as manager.

A construction and engineering consultant since his resignation in 1948 as executive vice president of F. H. McGraw & Co., Doremus will give his full time to Thomas Bryan business.

Whelan Made Patterson District Sales Manager

Thomas Whelan, Jr., has been appointed district sales manager for the Houston office of Patterson Foundry & Machine Co., East Liverpool, Ohio, according to Richard L. Cawood, company president.

Whelan was formerly with C. F. Braun Co., in the design and sale of processing equipment.

Engineer-Contractor Opens Houston Offices

Refinery Maintenance Co., Inc., engineers and constructors of refineries and natural-gasoline plants, now has permanent offices in Houston, at 4604 South Main Street.

Purpose behind this extension of R-M's main office in Compton, Calif., as announced by President F. J. Buckner, is to bring the company closer to its Mid-Continent and southwest customers.

Now in progress at the new office is engineering work and material procurement for the large gasoline plant R-M will erect for Shell Oil Co. at Elk City, Okla.

Lowery Shifted to Gulf Coast District Office

H. E. (Ike) Lowery, sales representative for Continental Supply Co. at the New Orleans district office, has been transferred to the district office in Houston as manager of drilling-equipment sales for the Gulf Coast.

John J. Dean, until June 1, salesman for Continental at the Houston district office, has been transferred to Harvey, La., as store manager.

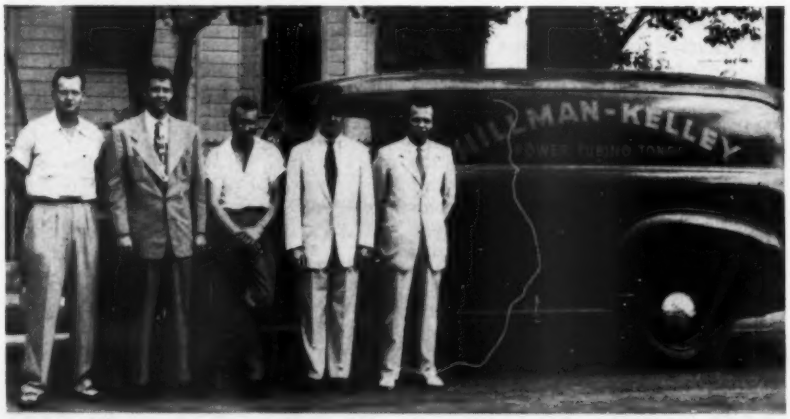
Youngstown Names Two as Operations Assistants

Two assistants to the vice president in charge of operations of Youngstown Sheet & Tube Co., have been appointed by A. S. Glossbrenner, recently elected vice president in charge of operations.

They are William H. Yeckley, formerly general superintendent of the Campbell Works steel plant, blast furnaces, and Struthers Works, and Dr. Karl L. Fetters, formerly special metallurgical engineer. He came to Youngstown as a test engineer in the fuel division in 1937, from the Lorain plant of National Tube Co.

Fetters graduated from Carnegie Institute of Technology and Massachusetts Institute of Technology. He joined Youngstown in 1936 as open-hearth metallurgist.

Hillman-Kelley Inaugurates New Field Service



Hillman-Kelley Co. has announced the formation of its new field service organization in the Gulf Coast area. The panel truck shown is completely equipped to handle all service jobs on Hillman-Kelley power tongs on location. Larry Kelley is in charge of the Gulf Coast and Mid-Continent offices. Pictured are Jim Montford, Larry Kelley, Don Young, R. W. "Ace" Elliott, and Clyde King, Jr., who is the Tulsa representative. Company offices are located at 2930 Pease Avenue, Houston.

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY...

CLASSIFIED ADVERTISING

UNDISPLAYED CLASSIFIED 12c a word one issue. 10% Discount three or more issues. $3.00 minimum charge. Blind Box in our care counts nine words. Payable in Advance.

DISPLAY CLASSIFIED
$12.00 a column inch one issue . . .
10% Discount three or more issues.

EQUIPMENT FOR SALE

1 COMPLETE String of Rotary Drilling Tools: Ideal Drawworks, Wheland Clutch, 7¼ x 14 New Type Wheland Pump, Waukesha Motors, 3600′ 4½″ Drill Pipe, 122′ Lee C. Moore Champion Rotary Derrick, Tool House and all necessary equipment goes with this rig. Anyone interested either write H. M. Williams Drilling Company, 701 Bitting Building, Wichita, Kansas, or telephone 48542.

1—Shot Hole Drill Truck, Chassis WHAX 1947 Dodge, Mayhew Drilling Unit—Model 600 Complete w/ Gardner-Denver 4½x5 mud pump. Mast 19 feet—Kelly 12½ feet. 100 feet 2⅜″ Used Drill Rod. 3—Dodge Water Trucks: 2 Ton Chassis WHAX—2 Ton, 400 Gallon Tank, Tulsa 18—Winch. 1—Model DDH—Oliver Cletrac Tractor w/ Hercules 6 cylinder Diesel Engine, Electric Starter and battery ignition complete with southwest cable controlled trailbuilder and Buckeye Double Drum Power Control Unit. If interested, write or call The Atlantic Refining Company, c/o Mr. V. H. Gray, P. O. Box 2819, Dallas, Texas, Telephone P7-6484, Station 8-273, Dallas.

VALVES—70 new 1″ Crane Globe, flanged, 150 lbs. Cat #3656XR—$15.00 each. H. Loeb & Son, 4643 Lancaster Ave., Phila. 31, Pa.

FOR SALE: New 1¼″ Improved plow steel wire lines 6 x 19 R L Hemp Core. One Spool 3500′ at 28c per ft. Four Spools 1800′ at 24c per ft. Thirty Spools 600′ at 20c per ft. FOB Okla. City, Okla. General Tool & Supply Co. P.O. Box 4387—1319 S.E. 29th. St., Okla. City, Okla.

Used Wood Tanks For Water-Flooding

5—vertical cypress tanks closed, 10′ dia. on bottom, 9′ dia. on top, 8′ high, 2¼″ staves, have manholes.
18—vertical cypress tanks, open top, 8′ dia. on bottom, 7′ 6″ dia. on top, 6′ high, 2¼″ staves
6—vertical oak tanks, closed, 7′ 4″ dia. on bottom, 6′ dia. on top, 8′ high, 2½″ staves, have manholes
10—vertical cypress tanks, closed, 9′ 6″ dia. on bottom, 8′ 6″ dia. on top, 7′ 6″ high, 2¼″ staves, have manholes
7—vertical cypress tanks, closed, 11′ dia. on bottom, 10′ dia. on top, 8′ 6″ high, 2¼″ staves, have manholes
28—vertical cypress tanks, closed, 10′ dia on bottom, 9′ dia. on top, 17′ 4″ high, 2¼″ staves, have manholes
2—vertical redwood tanks, open top, 17′ dia. by 17′ high, 3″ staves
All tanks complete with round hoops and lugs.

These tanks were used for beer storage and are in
FIRST CLASS CONDITION

Other sizes also available. Please write for complete specifications and prices.

• • • • • •

New and Guaranteed Used STEEL TANKS

Bolted Type up to 10,000 barrel.
Welded and Riveted up to 74,000 barrel.

Your inquiry will be appreciated.

A. GREENSPON PIPE CO., INC.
3615 Olive St., St. Louis 8, Mo.

EQUIPMENT FOR SALE

FOR CABLE TOOLS
DEGEN PIPE AND SUPPLY CO.
Box 107, Red Fork Station, Tulsa, Oklahoma

COOPER Single Drum Winch Tractor, Model W-201-26, with 45-foot mast, A-1 condition. $2250.00. Rogers Pipe & Supply Co., Tulsa, Phone 3-2072.

FOR SALE: Wilson Mogul drilling rig with portable derrick complete. Suitable for 4500′ depth. Now running in Bebee Field, Pontotoc County, Oklahoma. Contracts available. Lake Oil Company, Ada, Oklahoma.

FOR SALE: One 7¼ x 14 Whelan model 11000 Slush pump. New fluid end, gear box A-1. Melton Supply Company, Box 1360, Seminole, Oklahoma.

APPROXIMATELY 4300′ of 3½″ FH Drill Pipe, two 4½″ x 30′ Drill collars, Wilson elevators, Mission slips, one American overshot, slips for same, all sizes, few other 3½″ items, located at Upton, Wyoming. Priced at a real bargain. Kiowa Drilling Company, Inc., 717 Union National Bank Building, Wichita 2, Kansas. 3-8013.

BARGAIN FOR QUICK SALE

Large Steam Rig Complete Ready to go. 14x14 Engine, 18″ & 20″ Pumps, 10,000′ 4½ Drill Pipe, 136′ Drk All 300 Ton Equipment. Everything Good Condition. **McDaniel & Beecherl Drlg. Co.,** 521 Republic Bank Bldg., Dallas, Texas, or Phone 3651, Odessa, Texas.

FOR SALE

1—125 H.P. 350# Working Pressure "Oil Well Boiler," excellent condition. Completely reconditioned. Not used since last approved by State Boiler Inspector. Priced to sell. Make an offer.

POWELL BRISCOE, INC.
1916 First National Building
Oklahoma City, Oklahoma

FOR SALE
NEW LINE PIPE

150,000′ 6⅝″ OD x .250″ Wall 17.02# New. E.W. Range 3 Beveled Ends, 1,000# Test.

15,000′ 14″ OD x .375″ Wall New Seamless A-106 Grade A 54.57# 40′ Lgths.

This material is available for immediate delivery, quoted subject to prior sale.

Other Sizes Line Pipe and Tubing Available . . . For Prices Contact

A. J. STRUBEL
Sidney 1791
4946 Murdock, St. Louis, Mo.

EQUIPMENT FOR SALE

CULVER Vertical Furnaces for exfoliating Perlite $10,000 compared to $100,000 for old style, also purest of Perlite for sale. Particulars Box 2153-OJ, Denver, Colo.

CORE Drill Equipment for Sale: Two "Franks" truck mounted core drills, 2,000′ capacity; one shop built truck mounted core drill, 1,600′ capacity. All mounted on KR-11 International trucks. Four KB-7 International oil field trucks with jin poles and model 34 Tulsa winches. Four pole trailers with bolsters, three of them equipped with dollies for holding pipe loads. Approximately 2,500′ used 2⅜″ x 20′ drill pipe with 3⅜″ tool joints. Contact Mr. K. J. Reid or Mr. W. H. Hawkes, P.O. Box 1654, Oklahoma City. Telephone 2-6381.

BOILERS FOR SALE: 18 Code Oil Field Boilers, 50 to 87 H.P., 100 to 200 Lbs. W.P., Operated under Hartford into 1948, not fired since. Located on Leases vicinity Pampa, Texas. Offered subject to prior sale $500.00 to $700.00 Each, as is where is. Contact W. L. Godfrey or Max Harbison, Kewanee Oil Company, Pampa, Texas.

Several Army Surplus 4½″ x 6″ Gaso Duplex 1860 Pumps—two piece skid mounted with Chrysler 8 cylinder engines. Will sell pumps only or complete units about half price.

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Phones: 132—Rockdale, Texas
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2″ Standard 10,500 feet
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6″ Standard 28,000 feet
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10″ Standard 18,000 feet
12″ Standard 10,000 feet

All 20 foot random lengths
Excellent used condition

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Liquidating!

$100,000.00 STOCK OF PUMPS AT BARGAIN PRICES

CENTRIFUGAL PUMPS

2—Rex single stage, 7000 g.p.h., driven by one cylinder Wisconsin gasoline engine, mounted on rubber tired wheels.

2—B-J, Type H-SM, single stage, 165 g.p.m. @ 170′ head, direct connected to 10 hp, G.E., 220/440 v, 3 ph, 60 cy. induction motor.

2—B-J, Type H-SM, single stage, 125 g.p.m. @ 355′ head, direct connected to 20 hp, 220/440 v, 3 ph, 60 cy. totally enclosed, fan cooled motor.

2—B-J, Type H-SM, single stage, 800 g.p.m. @ 625′ head, direct connected to 125 hp, 3 ph, 60 cy, 440 v, totally enclosed, fan cooled motor.

2—B-J, Type H-SM, single stage, 125 g.p.m. @ 228′ head, direct connected to 10 hp, 220/440 v, 3 ph. 60 cy. totally enclosed, fan cooled motor.

2—B-J, Type 6STGMX, 6 stage, 250 g.p.m. @ 1300′ head, direct connected to 75 hp, 220/440 v, 3 ph, 60 cy, totally enclosed, fan cooled motor.

1—B-J, Type BM, single stage, 350 g.p.m. @ 150′ head, direct connected to 20 hp, 220/440 v, 3 ph, 60 cy, totally enclosed, fan cooled motor.

2—B-J, H-SM, single stage, 350 g.p.m. @ 227′ head, direct connected to 25 hp, 220/440 v, 3 ph, 60 cy. totally enclosed fan cooled motor.

1—B-J, Type LSM, single stage, 235 g.p.m. @ 304′ head, direct connected to 25 hp, 220/440 v, 3 ph, 60 cy, totally enclosed fan cooled motor.

2—B-J, Type LSM, single stage, 435 g.p.m. @ 550′ head, direct connected to 75 hp, 220/440 v, 3 ph, 60 cy, totally enclosed fan cooled motor.

1—B-J, Type S, single stage, 1870 g.p.m. @ 327′ head, direct connected to Elliott turbine 104 hp, 275# inlet steam pressure, 40# exhaust, non-condensing.

2—B-J, Type S, single stage, 2200 g.p.m. @ 335′ head, direct connected to Elliott turbine, 129 hp, 275# inlet steam pressure, 40# exhaust, non-condensing.

2—B-J, Type SM, single stage, 290 g.p.m. @ 515′ head, direct connected to 50 hp, 220/440 v, 33 ph, 60 cy, totally enclosed, fan cooled motor.

2—B-J, Type SM, single stage, 125 g.p.m. @ 520′ head, direct connected to 50 hp, 220/440 v, 3 ph, 60 cy, totally enclosed, fan cooled motor.

1—B-J, hydropress, Type 12L-8, 8 stage, 50 g.p.m. @ 1100′ head, direct connected to Coppus 19 hp, 275# inlet steam, 40# exhaust, non-condensing turbine.

1—B-J, Type H-SM, single stage, 120 g.p.m. @ 540′ head, direct connected to Elliott turbine, 40 hp, 275# inlet steam, 40# exhaust, non-condensing.

1—B-J, Type H-SM, single stage, 50 g.p.m. @ 388′ head, direct connected to 20 hp, 220/440 v, 3 ph, 60 cy, explosion proof, fan cooled motor.

2—B-J, Type L-SM, single stage, vertical split type, 70 g.p.m. @ 310′ head, direct connected to 20 hp, 220/440 v, 3 ph, 60 cy, explosion proof, fan cooled motor.

2—B-J, Type SM, single stage, 162 g.p.m. @ 100′ head, direct connected to 10 hp, 220/440 v, 3 ph, 60 cy, explosion proof, fan cooled motor.

1—Amsco Nagle, Type SW, vertical sump pump, 50 g.p.m. @ 58′ head, direct connected to 3 hp, 220/440 v, 3 ph, 60 cy. motor.

1—I-R, Type 2½ NT, horizontal split case, 4 stage, 300 g.p.m. @ 325′ head, direct connected to 100 hp, 440 v, 3 ph, 60 cy, totally enclosed, fan cooled motor.

2—I-R, type 1½ CRVH, single stage, vertical split, 75 g.p.m. @ 139′ head, one direct connected to 1½ hp, 440 v, 3 ph, 60 cy, totally enclosed, fan cooled motor and one to Elliott turbine 5 hp, type 2AY, 275# inlet steam, 5# exhaust.

1—I-R, single stage, 100 g.p.m. direct connected to 10 hp explosion proof, 220/440 v, 3 ph, 60 cy. motor.

2—I-R, sump pumps, type #25, direct connected to multivane air-motor.

1—I-R, Type #2 MRV-1S, 2 stage, 100 g.p.m. @ 125# P.S.I. head, direct connected to 15 hp, 220/440 v, 3 ph, 60 cy, explosion proof, fan cooled motor.

1—B-J, Type H-SM, single stage, 500 g.p.m. @ 304′ head, direct connected to 60 hp, 3 ph, 60 cy, 220/440 v, motor.

1—I-R, type #5-ALU, horizontal split case, single stage, double section, 1000 g.p.m. @ 125′ head, direct connected to 30 hp, 220/440 v, 3 ph, 60 cy, totally enclosed, fan cooled motor.

2—Barton-American, fire pumps, 600 g.p.m. @ 120 P.S.I., driven by Ford V-8 engine mounted on rubber tired trailer.

2—I-R sump pumps, single stage, 200 g.p.m. @ 10′ head, direct connected to multivane air-motor.

2—United Iron Works, Type SAB, single stage, 570 g.p.m. @ discharge pressure and direct connected to 30 hp, 220/440 v, 3 hp, 60 cy, totally enclosed, fan cooled motor and one to Elliott turbine 30 hp, type 2AY, 275# inlet steam, 45# exhaust.

2—B-J, type VC, 2 stage, 440 g.p.m. @ 840′ head, direct connected to Elliott turbine, 87 hp, type 2AY, 275# inlet steam, 45# exhaust.

2—B-J, type H-SM, single stage, 98 g.p.m. @ 230′ head, direct connected to 10 hp, 220/440 v, 3 ph, 60 cy, explosion proof, fan cooled motor.

1—B-J, type 12L-8, hydropress, 8 stage, 50 g.p.m. @ 1100′ head, direct connected to 25 hp, 220/440 v, 3 ph, 60 cy, totally enclosed, fan cooled motor.

2—B-J, type L-SM, single stage, 270 g.p.m. @ 366′, one direct connected to 7½ hp, 220/440 v, 3 ph, 60 cy, explosion proof motor and one to Elliott turbine, type 2AY, 28 hp, 275# inlet steam, 45# exhaust, non-condensing.

1—Amsco-Nagle, single stage, vertical shaft, type SW, 55 g.p.m. @ 20′ head, direct connected to 1½ hp, 220/440 v, 3 ph, 60 cy, motor.

1—I-R, type #5ALV, horizontal split case, single stage, double suction, 1000 g.p.m. @ 125′ head direct connected to 30 hp, 220/440 v, 3 ph, 60 cy totally enclosed, fan cooled motor.

2—B-J, type 41"S", horizontal split case, single stage, 500 g.p.m. @ 175′ head—no drive on one, one direct connected to Coppus turbine, 7½ hp, 275# inlet steam, 45# exhaust.

RECIPROCATING PUMPS

1—National Transit, 8x4x12, simplex, Ace piston type.

2—Union Steam Pump, 8x6x8, simplex.

2—Union Steam Pumps, 6x3½x6 duplex, piston type.

1—Union Steam Pump, 6x4x6 duplex, piston type.

MISCELLANEOUS PUMPS

1—Watson-Stillman, hydraulic, pressure testing pump, type 240A, fig. 8, 2000# /sq. inch, manual, ¾" connections.

1—Deming, hydraulic, single action, model #594, 400# /sq. inch, ¾" connections.

2—Schutte-Koerting, steam jet, vacuum pump, single stage, size 3.

1—Hills-McCanna, proportionating, type HB 2¼", fig. C-70, plunger type, stainless steel, cast steel body, 2.3 g.p.m. max. capacity, single stroke, ratchet drive with Boston type TB-40 geared speed reducer, driven by 2 hp, 440 v, 3 ph, 60 cy, explosion proof, fan cooled motor.

1—Hills-McCanna, type LM-10, single stage, 29.2 g.p.m., ratchet drive, H-M speed reducer drive, ¼ hp, 110 v, 60 cy, single phase, explosion proof motor.

2—Schutte-Koerting steam jet vacuum pumps, size 1½", type S, single stage, 1¼" connections.

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Towers and Vessels • Heat Exchangers and Condensers • Laboratory Equipment

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COTTON VALLEY, LA.
PHONE: COTTON VALLEY 26

EQUIPMENT FOR SALE

FOR SALE: Wilson Giant draw works, powered by two JL-1335 Buda engines with Wilson chain compound. Unit completely overhauled. Can sell separate or with a complete rig. For information, call or write Melton Supply Company, Box 1360, Seminole, Oklahoma.

FOR SALE: FAILING Model 36—800 ft. capacity, A-1 condition; 500 ft. drill pipe, 4 x 5 Gardner-Denver pump, 1949 International water truck. Complete with tools, subs, bailers, etc. Priced right. Sam Clark, Jr., 217-4th Ave. E., Roundup, Montana. Phone 197R.

SPUDDERS: Good used equipment. Fort Worth Models Super H. and C. Wichita 55. Wilson rotaries. Franks and Longyear machines. New and used tools and supplies. Fishing tools rented. Everything for well drilling. Pressey & Son, Pueblo, Colorado.

BARGAIN
4—100 HP Superior Twin Gas Engine COMPRESSORS—now operating in Oklahoma. Alfred B. Kern, 223 Wright Bldg., Tulsa, Oklahoma.

FOR SALE: One, type-100 National Drilling Rig has drilled only two wells. With 800,000 pounds capacity jack-knife derrick. Box D-448, The Oil and Gas Journal, Tulsa, Oklahoma.

7500′ of 2½″ Range 2 Upset Seamless Tubing. Call or write Edco Pipe & Supply Co., Box 565, Drumright, Oklahoma, Phone 933.

FOR SALE: Model 75 Wichita Trailer Type 3 drum-drilling and clean-out rig, A-mast, 120 HP Waukesha motor, 4500′ of ¾″ drilling & ½″ sand lines, dog house and drilling tools. J. W. Gookin, Box 641, Electra, Texas. Phone 560 or 1188.

CATERPILLAR ENGINE Model D-13000; Gaso pumps 1742, 10″ stroke, unit skid mounted and in operating condition. Indiana-Illinois area. Sohio Pipe Line Co., 407 No. 8th Street, St. Louis, Mo., Attn: Mr. H. F. Fisher.

ENGINES: 3—150 HP ME 66 Murphy Diesels. Excellent condition. Will sell 60% off new price. Must convert rig to gas. Interested in National C-250 or 18″ Pump. Fitzpatrick Drilling Company, Casper, Wyoming.

FOR SALE: One Gumbo Buster 26″ Oil Bath rotary table in good running condition. Attractive price. Melton Supply Company, Box 1360, Semniole, Oklahoma.

WAR SURPLUS MACHINERY
Gaso, Byron Jackson, Aurora, Wayne, Lombard & Hale Fire Pumps with Engines, 1½ to 25 KW Generator Sets or Light Plants, Engines, Suction Hose, Fire Hose, Victaulic Couplings & Etc. Write for listing. H. A. McCarthy, 310 Thompson Bldg., Phone 5-3296, Tulsa, Oklahoma.

41 ALLISON ENGINES
$395.00 Each
V-1710-49 and V-1710-53 12 cyl. Allison engines. 100 HP. No time since overhaul. Less nose gear. Can be converted to natural gas.
MILT GROBAN SUPPLY
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25,000 feet of 16″ OD x 5/16″ wall, used plain end line pipe f.o.b. Ohio.
10,000 feet of 16″ OD x ¼″ wall, used plain end line pipe f.o.b. Ohio.
15,000 feet of 12¾″ OD x ¼″ wall, used plain end line pipe f.o.b. Ohio.
ROGERS AND WRIGHT COMPANY
710 Peoples Building
Charleston, West Virginia
(Phone 3-0171)

EQUIPMENT FOR SALE

SENSITIVE ALTIMETERS. Tells how high the hill—how deep the valley. Used by geologists and engineers. Ideal for automobile installation. Can also be used as a barometer. Reliable movement made for aircraft. Only $12.50 each. Aero Instrument Supply, 8432 Cedar Springs, Dallas, Texas.

FOR SALE: Repossessed 1942 Sullivan Rotary Drill Model "N" Trailer mounted, 50 h.p. Buda power, hydraulic throughout except cable drum, Gaso 4/10 mud pump 33 h.p. motor, 1900 ft. 2⅞ P.K. Rod, many bits, heads, tools, good condition. Can be purchased for outstanding indebtedness $3500.00. Ben Sherman, Phone 243, Deming, N. M.

FOR SALE: One combination houseboat and boathouse. Built on steel barge 85 ft. long x 28 ft. wide x 9 ft. deep. One end constructed with wings similar to a floating drydock with cradle to accommodate a 42 ft. cruiser. An installed pump will pump the barge down, allowing the cruiser to be floated into place. The barge is then pumped up and the cruiser stored dry. Entire barge is covered with roof and sides and boat end is closed with overhead door. Opposite end houses very fine quarters, lounge, galley and washroom and an awning covered sun deck. Ideal for the sportsman or oil operation in inland waters. To our knowledge the only vessel of its kind in existence. Can be inspected by appointment at Rockport, Texas. Write Gulfport Shipbuilding & Drydock Corporation, Port Arthur, Texas, or call 2-6486.

FOR SALE
(SUBJECT TO PRIOR SALE)
3 Bolted tanks, 2 in original crates and one assembled. (100 Bbl.). 69′-14″ 57# Drive Pipe; 170′-10¾″ 41# Drive Pipe; 407′-10¾″ 32.75# Casing 8Rd. Thd. Smls.; 3045′-8″ 24# Casing 8Rd. Thd. Smls.; 6286′-7″ 23# Casing 8Rd. Thd. Smls.; 8101′-3″ 9.20# Tubing Smls.; 1453′-2⅛″ Tubing EUE Smls.; 14,226′-2″ 6.40# Regular 10Rd. Thd.; 375′-¾″ Pumping rods; 9-5″ Orbit Gate Valves; 9-3″ Orbit Gate Valves; 3-2″ Orbit Gate Valves; 3-2⅞″ x 6″ Parmco Combination Packer; 1-2⅞″ x 6″ Larkin Screw Trip Packer; 1-3″ x 6″ Parmco Packer; 1-2⅞″ x 6″ Gas Anchor Packer. M. B. Belden Office at 425 2nd St. N. W., Canton 2, Ohio. Phone 4-6147.

4100′ 2½″ Upset 8 Round Thread Seamless Tubing Used a Few Months. Guaranteed like new. .60c per foot F.O.B. Lease, Haven, Kansas. 1121 Union National Bank Bldg., Phones 4-2121—6-0996—Wichita, Kansas.

TWO TYPE 8—80 H.P. direct driven Bessemer gas engines, one with 16 x 20 compressor, other with 32 x 20 compressor. Location Desdemona, Texas. $750.00 each. Desdemona Gasoline Co., 401 Danciger Bldg., Fort Worth, Texas.

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Nickel Cadmium Alkaline Batteries, for diesel engine starting, marine service or seismograph work. Twelve-four cell in wooden cases 16″ high, 26½″ long, 12″ wide. Type D.K.M. 48. Amp. hours 290 Charge 58 amps for seven hours. Never been used, can be had at large discount.
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One with U 34 Unit draw works; 6 cyl. GMC Diesel engine; 7¼ x 10 Type A Emsco triple X power pump. The other with P-150-46 Emsco draw works; R 61 Climax engine; 7¼ x 12 FXZ Gardner Denver pump with P-225 Climax engine. Both have 3,000 ft. drill pipe and all necessary tools and equipment. Also 16,000 ft. new and used casing; 10,000 ft. new and used tubing.
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150,000 ft. 6⅝ O.D. New Range 3 Elec. Weld #17.02
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EQUIPMENT FOR SALE

USED ROTARY AND CABLE TOOL DRILLING TOOLS, WIRE LINES. E. A. KELLY, BOX 861, OKLAHOMA CITY. PHONE 5-6407.

TWO Gardner Denver Compressor Units size 12 x 11 and 4¾ x 11, direct connected with 100 HP electric RPM motor, complete with all equipment; located at Refugio, Texas; in service forty-five days. Will take reasonable discount. Clymore Petroleum Corporation, 1204 Alamo National Building, San Antonio, Texas.

DRILLING RIG FOR SALE: Failing 314, mounted on GMC—6x6; 1,000 ft. drill-pipe; light plant & all accessories. Garner Instrument Co., Stinson Field, San Antonio, Texas.

FOR SALE: One 7¼ x 14 FXK Gardner Denver power pump in first class condition. Late model pump with all new improvements. S. E. Frogge Equipment Company, Box 4455, Oklahoma City, Oklahoma, Phone 6-5518, Residence 2401 Moore.

EQUIPMENT WANTED

WANTED: 4½″ DRILL PIPE
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The Oil and Gas Journal, Tulsa, Okla.

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Soundly established, progressive firm has openings for three district sales representatives. Experience in pipe, valves or fittings an asset. Excellent opportunity. Write Box D-516, The Oil and Gas Journal, Tulsa, Oklahoma, stating complete detailed background. All communications confidential.

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FOR CHEMICAL PLANT
Located in South

ESTIMATORS

Must be experienced engineers, under 40, familiar with Refinery and Chemical Plant design and capable of estimating process equipment installations from flow diagrams and specifications. Give full information, experience record and salary expected.

DRAFTSMEN-DESIGNERS

Preferably with ME, CE, or EE degree, under 40, with at least three years drafting experience in Chemical or Oil Industry. Give full information, experience record and salary expected.

BOX D-530
THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

XUM

HELP WANTED

FOREIGN and Domestic Oil Employment Directory (including late supplement of oil companies and drilling contractors in Western Canada). Over 500 listings in drilling, production, refinery, natural gasoline, pipelines, geological, exploration, supplies, manufacturers, services and refinery and pipeline contractors, showing where to apply for jobs. Price $5.00. Oil Industry Mailing List, Box 2603, Tulsa, Okla. (Our 30th year).

CONTROLLER

Integrated Oklahoma oil company wishes to employ experienced, aggressive accountant under 45 years of age. Should possess initiative, ability to handle personnel, and experience in installation and operation of general accounting system and cost controls. Excellent future. Salary commensurate with qualifications. All replies confidential. Address Box D-550, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: SEISMOGRAPH PARTY CHIEFS—For field work in Alberta, Canada. Single or married men, no children, preferred. Minimum two years party chief experience required with university geological or geophysical background. Salary open based on experience and general ability. Excellent opportunity for men willing follow field work. Box D-531, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERS, Executives, Technical Men. Salaried positions — $3600 to $30,000. This confidential service for outstanding men who desire a change of connection, will develop and conduct preliminary negotiations without risk to present position. Send name and address for details. Tomsett Associates, 1204 Berger Bldg., Pittsburgh 19, Pa.

QUALIFIED Magnetometer Operator-Party Chief for South America. All expenses for wife and family. Qualified personnel only apply. Exploration Surveys, Inc., 5615 Daniels Ave., Dallas, Texas.

SALES ENGINEERS
OPERATIONS SUPERVISORS
PERFORATOR OPERATORS

Only Experienced Men Need Apply.

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3909 Hemphill Street, Fort Worth 9, Tex.

GAS ENGINEER WANTED

By consulting engineering firm located in New York City. Applicant should have had experience with either transmission or distribution of natural gas. Analytical ability desired in connection with certificate and rate work. Age 35-45. Reply giving age, education, experience, references and salary required. All replies kept confidential. Write Box D-487, The Oil & Gas Journal, Tulsa, Oklahoma.

REPRESENTATIVE WANTED

Aggressive manufacturer's representative needed for Houston and Gulf Coast territory for sale of complete line of Oil and Gas Separators and related specialties for production, refining, and chemical industries. Firms having engineering graduate salesmen and no control accounts given preference. Replies should include number and background of sales personnel, territory actively covered, present active accounts. No supply houses or engineering companies need apply. Replies will be held confidential.

Box D-539
The Oil and Gas Journal
Tulsa, Oklahoma

HELP WANTED

WANTED: Refinery combination machinist pump and engine mechanic. Must be thoroughly experienced. Maximum age 40 years. Box D-554, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—Geophysicist with geological background by independent oil company to review, interpret seismic data. Must have knowledge of instruments and techniques. Permanently located in Houston. State age, training, experience and expected salary. Address Box D-549, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS ENGINEER: For independent refinery in Chicago Area. Engineering degree preferred. Must have minimum experience of 5 years in process work connected with Topping, Thermal Cracking, Catalytic Cracking, Treating and Plant Inspection. Replies will be held confidential. Address—P. O. Box 297, Blue Island, Illinois.

DRILLER—Wilson or Failing experience, permanent job in the east on water wells. Give all details. Box D-560, The Oil and Gas Journal, Tulsa, Oklahoma.

NEW 3000 BBl/day refinery has immediate vacancy for experienced shift supervisor qualified in vacuum distillation of asphalt and butane-propane operations. Transportation expenses paid. In reply, state experiences. Interested applicants write airmail to Pacific Refiners, Limited, P. O. Box 1960, Honolulu, T. H. Attention: "P.C."

SITUATIONS WANTED

LAND MAN, 31, Legal Education, Abstract experience, Leased and perfected titles in Texas, Louisiana and Mississippi. Three years with Major Company, desires change, good reason. Go anywhere. Job must have good future. Box D-537, The Oil and Gas Journal, Tulsa, Oklahoma.

BRADFORD man with intimate knowledge of Bradford, Oil City, Pa.; Bolivar, N. Y., Oil Fields also new Renova Gas Field can give expert representation to manufacturers who need sales supervised in these areas. Thoroughly familiar with secondary recovery problems and equipment sales. Can sell direct or push thru Supply Companies. Exceptional opportunity. Reply Box D-533, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No. 131, Ph. No. 131, Hobbs, New Mexico.

PROGRESSIVE PLANT MANAGER for grease and lube oil plant. Fifteen years managerial experience—production control, product development, inventory control, purchasing, costing, personnel, traffic. Salary commensurate with position. Box D-542, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED IN EAST TEXAS field, preferably near Kilgore or Overton, work supervising and producing lease or number of leases. Will do all flowing or pumping on per-well or percentage basis. Can furnish own manpower and car. If interested, contact Box D-546, The Oil and Gas Journal, Tulsa, Oklahoma.

PROPERTY ACCOUNTANT - MANAGER: Extensive experience as accountant, engineer properties all divisions of petroleum industry. Valuations, Records, Reports, Costs, Budgets, Depreciation, Depletion, Taxes, Economic studies. Box D-551, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE ENGINEER, Age 32, ten years experience, terminating five years foreign pipe line projects. Desires return to U.S.A. Completely experienced in all phases pipe line, station and terminal design and construction. Will consider work in expanding natural gas industry. Available for interview August 1. D-557, The Oil and Gas Journal, Tulsa, Oklahoma.

WATER FLOOD engineer, now employed, looking for broader opportunities. Three years experience, secondary recovery, Bradford Field. Holds degrees in Geology and Petroleum Engineering. Age 30, married, has family. Box D-556, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

CHEMICAL ENGINEER—age 36—available immediately—10 years experience as engineer, technologist, salesman, superintendent large and small refineries, independent contractor. W. R. Shelton, 2613 Oakwood Terrace, Fort Worth, Texas.

REFINERY SUPERINTENDENT

Experienced and competent. Excellent record and references. Box D-556, The Oil and Gas Journal, Tulsa, Okla.

GRADUATE Petroleum Engineer, three years experience with reservoir engineering firm and one and one-half years experience in drilling and production, desires connection with small company or independent in West Texas area. Details on request. Reply Box D-559, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTORNEY, young, single, admitted to Colorado Bar, desires permanent position in oil industry where legal education useful. Box D-561, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, young, excellent health, married, 10 years' experience in Mid-Continent, Rocky Mountains, South America, desires responsible position with progressive independent or major. Thorough knowledge of all phases oil field practice. Not averse to travel or foreign assignment. Box D-562, The Oil and Gas Journal, Tulsa, Oklahoma.

RECENT GRADUATE GEOLOGIST seeking permanent position. Experienced in oil fields. Anything considered. R. P. Smith, 1206 South Baltimore, Tulsa, Okla., Phone 4-9311.

REFINERY ACCOUNTANT. Thoroughly experienced refinery operations, processes, costs, yields, competent to manage all office matters large or small refinery. Box D-551, The Oil and Gas Journal, Tulsa, Oklahoma.

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160 ACRES Linn County, Kansas, with 20 wells, 248' deep, already equipped for water flooding. For information write: 3016 Ruth, Houston 4, Texas.

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Producing and Nonproducing
Bought and Sold—Any Area
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Bismarck, North Dakota

(Member National Oil Scouts and Landmen Association. References exchanged).

XUM

LEASE AND DRILLING BLOCKS

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Box D-538
The Oil and Gas Journal
Tulsa, Oklahoma

All replies will be treated with the strictest confidence.

CALENDAR

June

Petroleum Equipment Suppliers Association, annual membership meeting, Greenbrier Hotel, White Sulphur Springs, W. Va., June 25-27.

American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 26-30.

American Petroleum Institute, midyear division of production and standardization conference, Brown Palace Hotel, Denver, June 26-30.

July

Institute of Petroleum, oil shale and cannel coal conference, Glasgow, Scotland, July 3-7.

Pacific Coast Gas Association, annual convention, Seattle, Wash., July 31-August 3.

August

Interstate Oil Compact Commission, summer meeting, French Lick, Ind., August 3-5.

September

National Chemical Exposition, Chicago Coliseum, Chicago, September 5-9.

American Institute of Chemical Engineers, regional meeting, Minneapolis, September 10-13.

American Society of Mechanical Engineers, and Instrument Society of America, Municipal Auditorium, Buffalo, N. Y., September 11-15.

National Petroleum Association, Hotel Traymore, Atlantic City, N. J., September 13-15.

Instrument Society of America, annual instrument conference and exhibit, Municipal Auditorium, Buffalo, N. Y., September 18-22.

American Society of Mechanical Engineers, petroleum mechanical engineering conference, Roosevelt Hotel, New Orleans, September 24-28.

October

American Gas Association, annual convention, Atlantic City, N. J., October 2-6.

Mid-Continent Oil and Gas Association, Texas division, Dallas, October 4-5.

Petroleum Branch, American Institute of Mining and Metallurgical Engineers, Mid-Continent meeting, Roosevelt Hotel, New Orleans, October 4-6.

American Association of Oilwell Drilling Contractors, annual meeting, Mayo Hotel, Tulsa, October 12-13.

Petroleum Branch, American Institute of Mining and Metallurgical Engineers, West Coast meeting, Elks Club, Los Angeles, October 12-13.

Permian Basin Oil Show, Odessa, Tex., October 19-22.

Independent Natural Gas Association of America, annual meeting, Shamrock Hotel, Houston, October 23.

November

American Petroleum Institute, annual meeting, Biltmore and Ambassador Hotels, Los Angeles, November 13-16.

NOMADS

Tulsa Nomads, third Friday of each month. After Five Room, Tulsa Hotel.

Dallas-Fort Worth Nomads, first Monday of each month, Greater Dallas Club.

Houston Nomads, second Monday of each month. Ye Ole College Inn, Houston.

Los Angeles Nomads, second Wednesday of each month, Jonathan Club.

New York Nomads: June 27, golf party, Ardsley (N. Y.) Country Club.

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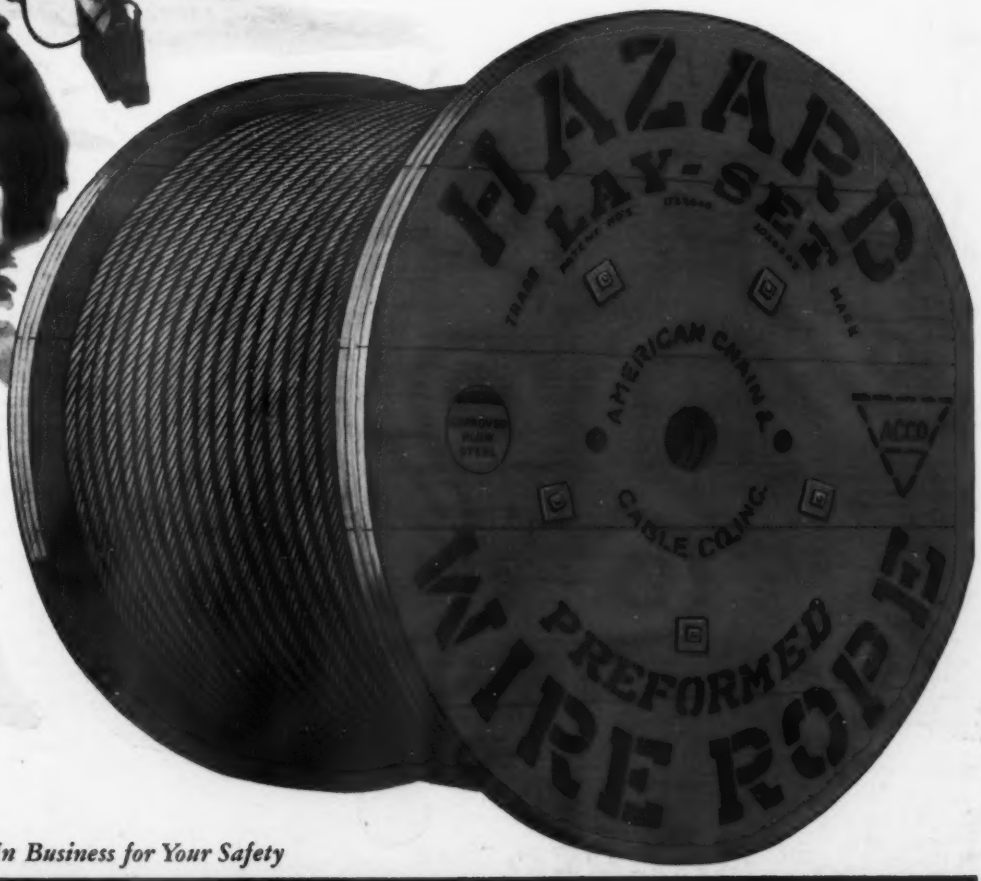

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